The Emergence of the Magic Lantern Trade in Nineteenth-Century England.

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Abstract

The English magic lantern trade emerged over several decades after 1821, following the appearance of the Improved Phantasmagoria Lantern. This new lantern reframed the instrument as a must-have commodity and catapulted optical media towards a popular market. This moment laid the groundwork for a larger professional trade that thrived towards the end of the nineteenth century.

Most lantern scholars leap over the decades at the beginning of the century, ignoring their importance as a period of experimentation. Even those few that do acknowledge the significance of the early media crazes fail to realise the social conflicts of these years. The machines that retailers were using to get rich had long been used by poor performers. The experimental retail practices relied on an infrastructure of working-class labourers. Another lantern culture was destroyed by the genesis of a professional trade. That we have so far failed to write these people into the story is a result of historical blindness in our own time and our reluctance to critique the survival of material and documentary evidence.

This thesis critiques the accepted history of the English lantern trade. I explore the practices used by lantern makers of the early nineteenth century, focusing on Philip Carpenter, whose influence dominates lantern scholarship. Despite wide acceptance of his importance, little new knowledge on Carpenter has been produced in decades. I present a comprehensive analysis of his practice and its impact, showing that he was more typical of his era than others have thought, that his innovations were questionable, and that he was preceded by other, equally inventive, instrument makers. The emergence of the lantern trade was a product of intersecting economic, industrial, and cultural circumstances.

Contents

Abstract 2

Illustrations 4

Acknowledgments 7

Declaration 9

Introduction 10

Methodology 38

Chapter 1. Philip Carpenter and the Improved Phantasmagoria Lantern 53

Chapter 2. The Domestic Phantasmagoria 77

Chapter 3. Charles Blunt 105

Chapter 4. Consumer Media in Analogue Trades 133

Chapter 5. The Kaleidoscopes and its Makers 169

Chapter 6. Making the Magic Lantern 190

Chapter 7. Itinerancy and Working-Class Lantern Culture 222

Conclusion. The Emergence and Decline of the Magic Lantern 257

References 263

Illustrations

Illustrations appear at the end of the relevant section.

Full details and credits are given alongside each image.

Fig. 1. Improved Phantasmagoria Lantern by Philip Carpenter 66

Fig. 2. Advertisement for the Copper-Plate Sliders and examples of slides 67-68

Fig. 3. Trade card for John Cuff 72

Fig. 4. Trade card for John Bennet 72

Fig. 5. Trade card for Nathaniel Hill 72

Fig. 6. Advertisement for Philip Carpenter 72

Fig. 7. Engraving of a domestic Phantasmagoria performance, 1823 80

Fig. 8. Engraving of a domestic Phantasmagoria performance, 1850 80

Fig. 9. Belt-attached Improved Phantasmagoria Lantern by Philip Carpenter 80

Fig. 10. Phantasmagoria Lantern by an unknown maker 80

Fig. 11. Subjects in Natural History slide (zebra, hippo, Tapir, sheep) 80

Fig. 12. Subjects in Natural History slide (rodents) 89

Fig. 13. Subjects in Natural History slide (condor, vulture, eagle, owl) 89

Fig. 14. Subjects in Natural History slide (tortoise, turtle, frog, pipa) 89

Fig. 15. Subjects in Natural History slide (dragon, crocodile, Dracæna, basilisk) 89

Fig. 16. Comparison of natural history images in print and lantern slide 90

Fig. 17. Box of slides by Carpenter & Westley 96

Fig. 18. Subjects in Natural History slide (human, orangutang, ape, baboon) 102

Fig. 19. Subjects in Natural History slide (lions, tiger, leopard) 102

Fig. 20. Subjects in Natural History slide (armadillo, rhino, elephants) 102

Fig. 21. Trade card for Thomas Blunt 113

Fig. 22. *Elements of Astronomy and Geography Explained* picture cards 113

Fig. 23. Comparison of astronomy images across slide makers and print 114

Fig. 24. Comparison of natural history images across slide makers 115
Fig. 25. Comparison of natural history images across slipping-slide makers 115
Fig. 26. Transfer-printed tile by Sadler & Green 118
Fig. 27. Details from Kings and Queens of England slides 118
Fig. 28. Pantograph by Charles Blunt 123
Fig. 29 Patent illustration for Schmalcalder's tracing apparatus 123
Fig. 30. Silhouette made by Prosopographus, the Automaton Artist 123
Fig. 31. Advertisement for a mechanical silhouette artist 123
Fig. 32. Dark lanterns 131
Fig. 33. A dark lantern / magic lantern hybrid 131
Fig. 34. Illustration from *Apparitions; or, the Mystery of Ghosts* 131
Fig. 35. Optical diagram picture cards by Mary Lewis 132
Fig. 36. Anamorphoses 139
Fig. 37. A transparency 139
Fig. 38. Advertisement for John Scott 140
Fig. 39. Bullseye lantern by John Scott 141
Fig. 40. Slides by John Scott 141
Fig. 41. Thaumatrope by William Phillips 148
Fig. 42. Pirated Thaumatropes 148
Fig. 43. Myriorama by Samuel Leigh 151
Fig. 44. Phenakistiscope by Alphonse Giroux 151
Fig. 45. Phantasmascope disc by Ackermann & Co. 155
Fig. 46. Set of Fantascope discs by Ackermann & Co. 155
Fig. 47. Phenakistiscope disc by S.W. Fores 155
Fig. 48. Matrix for a Phenakistiscope disc 156
Fig. 49. Two mechanical slides showing a sleeping man swallowing rats 160
Fig. 50. Sample paintings from Carpenter & Westley's shop 161
Fig. 51. Comparison of sample painting and slides 162
Fig. 52. Two decorative enamelled bonbonnières 166
Fig. 53. Brewster's Patent Kaleidoscope by Philip Carpenter 176
Fig. 54. Object cells and lenses for Brewster's Patent Kaleidoscope 176
Fig. 55. Brewster's Patent Kaleidoscope by Carpenter & Westley 177
Fig. 56. Watercolour by Leopold Kupelwieser 177
Fig. 57. Advertisement for Brewster's Patent Kaleidoscope 182

Fig. 58. Polyangular Kaleidoscope by R.B. Bate 183

Fig. 59. Trade card for R.B. Bate 183

Fig. 60 Kaleidoscope by Dollond 183

Fig. 61. Mechanical slide showing a comet by Dollond 189

Fig. 62. Cometarium by W. & S. Jones 189

Fig. 63. Orrery by W. & S. Jones 189

Fig. 64. Miniature telescope by an unknown maker 195

Fig. 65. Trade card for The Artizan's Library, Birmingham 195

Fig. 66. Brewster's Patent Kaleidoscope by James Cam and J.P. Cutts 209

Fig. 67. Trade card for J.P. Cutts / Cutts & Cam 209

Fig. 68. Trade card for J.P. Cutts, Sutton, & Son 210

Fig. 69. Phantasmagoria Lantern by an unknown maker 210

Fig. 70. Compendium Magnifier by J.P. Cutts, Sutton, & Son 210

Fig. 71. Receipt by Philip Carpenter for a gold eyeglass with pebble finish 216

Fig. 72. Postal box and spectacles by Carpenter & Westley 216

Fig. 73. Five slides in the Galantee style 229

Fig. 74. Four slides illustrating short humorous sketches 230

Fig. 75. Illustrations of itinerant performers 231

Fig. 76. An itinerant's lantern 241

Fig. 77. An engraving of an itinerant lanternist, by Poisson 241

Fig. 78. Three slides showing a procession of animals towards the ark 242

Fig. 79. Slide showing Bonaparte's Egyptian campaign 242

Fig. 80. Slide showing a political allegory on British sea power 242

Fig. 81. Four-slide sequence showing Bonaparte's flight From Moscow 243

Fig. 82. Eight slides with portraits of notable men 244

Fig. 83. Seven slides showing Pull Devil, Pull Baker 253-254

Fig. 84. Detail from a slide showing Bonaparte embracing the devil 254

Fig. 85. Pull Devil, Pull Baker ! ! ! Or, The Baker's Act 255

Fig. 86. A New and Curious Dialogue Between the Devil and a Baker 256

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, university. All sources are acknowledged as references.

Early findings from this research project have previously been published in *Early Popular Visual Culture, The Science Museum Journal,* and *The Magic Lantern.*

Introduction

I. The Lives of the Magic Lantern

A magic lantern is a camera obscura turned inside out. In its early life it was a little tin box that projected hand-painted images. In its later life it became a tall mahogany tower with three lenses and cases of slides on every imaginable subject. Lanternists threw all manner of stories before their audiences, faded between images, produced complicated light effects and moving scenes. The lantern taught audiences about the wonders of science, and the rewards of abstinence, and elephants taking revenge on troublesome monkeys. Sleeping men swallowed rats.

It is very difficult to tell the lantern's own story because it has lived so many lives. It emerged from the workshops of Enlightenment scientists in the later sixteenth century, and was quickly taken up by the very rich and the very poor. Through the eighteenth century the lantern toured palaces and villages. In the nineteenth, a very famous lantern business exhibited to royalty at Windsor (ScM 1948-397/12). Robert Buchanan gave a lantern show to the Manchester Chartists at Tip Street (Pickering 1995: 110). The lantern was a toy and a scientific instrument. It raised the ghosts of despots and brought celestial bodies into drawing rooms. It produced the first moving pictures and illuminated living microscopic beings. The lantern was a commodity and a trifling luxury, but it was also a vital means of income, the economic blood of a travelling entertainer. The magic lantern lived a marginal life among unwashed hands, but it was also the preeminent technology for distributing images in the public realm.

Existing research demonstrates the immense variability of the lantern. Its lives have been unrolled in microcosm through scattered fragments. It survives in museums, and private collections, and in dispersed entries in the documentary record. The literature clusters into numerous discourses on technology, retail, exhibition, storytelling, and scientific education. There is no common thread that runs through this field of knowledge. There is no history of the magic lantern because it has always lived within different social and economic contexts. Every life of the magic lantern is a world with its own rules and needs, its own characters, inventions, breakthroughs, and crises.

When I began work on the magic lantern, I had intended to write the *longue dureé* history of its emergence from the workshops of the industrial revolution and its growth into the very first media trade. I saw that the late nineteenth-century trade established many approaches for exploiting optical technology, later adapted by the early cinema networks, music halls, amateur photographers, and domestic media businesses around the beginning of the twentieth century. One moment in 1821 offered a simple explanation. In this year, a new instrument and a new image-production technique made a different way of living with images possible. Philip Carpenter, an optician from Birmingham, developed two dazzling innovations that changed media history.

While most historians begin the lantern's story with Christiaan Huygens, natural philosopher and agreed inventor, others defer the genesis of the modern media into the 1820s. John Barnes (1970: 42–43, 1984: 8), Laurent Mannoni (2000 [1995] 289-290), Hermann Hecht (1980: 3, 1193: 77), Stuart Talbot (2006), Hankins and Silvermann (Hankins and Silverman 1995: 65), Mervyn Heard (2006: 197), Granville Ganter (2014: 727), Francisco Javier Frutos (2013: 7), and Trevor Beattie (2013: 6) all agree that Carpenter's influence on the lantern was formative. John Barnes called him 'perhaps the most important person in the history of the magic lantern in the nineteenth century' (1984: 8). In Carpenter's own century, Samuel Timmins (1967c [1866]: 534) and H.W. Harrison (1887, 1888) had already identified him as progenitor of the lantern trade. I was in bustling company.

Barnes' casual claim (made before I was born) that 'very little is generally known about the man' (1984: 8) was untrue. I discovered much to be said about Carpenter, his life, working methods, and media world. I published three articles drawn from surviving materials that Barnes had not found (2016a, 2016b, 2017). I read texts that Carpenter had written, revealed his more famous brother, his entrepreneurial sister, and an extended family of artisans, scientists, and Unitarian businesspeople. Carpenter's historical footprint was very big, and no one had yet unveiled its extent.

But Carpenter did not work alone. In 'Building Media History From Fragments' I revealed the networks of minor practitioners around him (2016a). He was exploiting the expertise of a vast infrastructure of workshops to produce the instruments that were changing media history. I noted the curious reluctance of other slide producers to follow his new automatic production techniques. This posed unexpected questions. If his transfer process was the birth of mass-produced lantern images, as many historians claim, then where was the evidence of its impact on slide production across the sector? And even if I could demonstrate Carpenter's transformative impact, what of the

networks of tinsmiths, glass grinders, engravers, slide painters, button pressers, and brassfounders? Carpenter was part of an infrastructure with a history of its own.

The existing literature ignores the reciprocal relationship between the major media retailers and wider manufacturing base. I wanted to understand Carpenter's contribution in its economic, industrial, and cultural context.

The media chronologies by Barnes (1970, 1985, 1997), Mannoni (2000 [1995]), Hecht (1980, 1984a, 1984b), C.W. Ceram (1965), and others, tend to dance rapidly between different technical innovations. They followed an arc that had been in constant use since the middle of the nineteenth century, when W.B. Carpenter (1868), Harrison (1887, 1888), and Edward Dunmore (1896-1897) attempted to chronicle the emergent visual technologies. Other texts eschewed the problem of emergence entirely, drawing critical discussion from the mere existence of technologies, without asking why they should exist in the first place.

I found that the most useful research was concerned with the practice of technology. Among the media historians, I mined Siegfried Zielinski (2008 [2002]), Friedrich Kittler (1999 [1985], 2010 (1999), Sean Cubitt (2014), and Deac Rossell (1998, 2008, 2014). Elsewhere, I read how Maxine Berg connected manufacturing labour with consumer luxury (1994, 2005). I followed A.D. Morrison-Low (2007) and Anita McConnell (1994, 2016) into the world of the scientific instrument makers. I questioned what methods Walter Benjamin used to rebuild a Paris of the nineteenth century (1999 [1982]), and Fernand Braudel the Mediterranean of the sixteenth (1975 [1966]). I returned to several thunderous bodies of evidence collected by Hermann and Ann Hecht (1993), Richard Altick (1978), Stephen Herbert (2000), and Robinson, Herbert and Crangle (2001). I wanted to piece together a different history.

This is my contention: there were many worlds of the magic lantern, unfolding around many different contexts. There were worlds populated by rich innovators and others by poor labourers. The lantern was an exhibition tool and a consumer object. The rules of its use, its importance, and its potential profitability were variable depending on how, and where, and by whom it was used. There is not one history, but several intersecting histories told by surviving material and documentary fragments.

I focus on the decades between 1800 and 1830, and suggest their resonance on the later English lantern trade. Most scholars jump over these years, but they are crucial to the emergence of the lantern trade and to the operation of all subsequent forms of media culture. This was the moment when many of the rules for visual media were established.

I want to show the vitality of these overlooked decades in media history. The 1810s and 1820s were a period of technological and retail experimentation that laid down the structures and approaches for the mass media networks of the later century. This was achieved by instrument makers like Philip Carpenter, but also many contemporary retailers, printers, painters, lens grinders, tinsmiths, brass founders, and scientists. We do not even know the names of many of the poor labourers who contributed.

II. What is this Thesis About?

My research was mostly done underground, in the research centre of the National Science and Media Museum. This museum holds around 100 lanterns and perhaps 10,000 slides, in addition to other assorted objects relating to the lantern trade. They have been collected over one hundred years by the Media Museum, Science Museum, and the former Kodak Museum. They were each selected for preservation because they represented some important facet of the histories of cinema and photography. I was given object-handling training, access to the database, a set of keys, and tasked with discovering the significance of the collection. I used the collection everyday. I catalogued items, handled them, drew out relationships between them. In some cases, I disassembled objects to understand their operation. I examined their provenance and created, in my mind and on paper, shifting maps of the collection, showing where these optical machines came from, who had used them, and the conceptual relations they all had to the literature. Having the privilege of living with a collection over a period of time was hugely influential to my thinking. I returned to objects in light of later discoveries and learned to understand lantern culture by exposure to its productions. I now know on sight if an image is common or unusual because I have seen so many slides. Without this collection I would not have asked so many questions of Carpenter's legacy, nor reappraised my findings quite so often.

Beyond Bradford's national museum, the magic lantern is well (if unevenly) preserved in collections around the world. I visited Paris, Torino, Girona, Edinburgh, London, and Exeter to view vast collections of lanterns and slides.[1] I am indebted to private collectors for information and insights, drawn in turn from their own collections, each with idiosyncrasies that give different perspectives on lantern history. The Lucerna

[1] Significant collections are held by the Cinémathèque Française in Paris (including the Will Day collection), Museo Nazionale del Cinema in Torino (including the Barnes and Prolo collections), Museu del Cinema in Girona (based on the Tomàs Mallol collection), Museo del Precinema in Padova (based on the Minici Zotti collection) and the Bill Douglas Museum in Exeter (based on the Douglas and Jewel collection).

database provides access to information on a further (to date) 130,000 slides, drawn from information in catalogues, museums, and private collections.[2] The existence of such a large body of objects gives an indication of the size of the challenge facing lantern historians. These collections are material evidence of people manufacturing and selling lanterns, of grand optical entertainments, simple performances in back rooms, or children tinkering with toy lanterns.

In England, the mass exploitation of the magic lantern was enabled by its organisation into a formal trade around the middle of the century. Between 1860 and 1910 there grew a large and well-organised lantern trade, driven by apparatus and slide manufacturers, and catering to professional entertainers, public lecturers, and amateur lanternists. The largest portion of this trade was located in London, on the streets around Westminster and the City, but through well-established manufacturing and distribution networks, it spread over the country, with leading retailers operating in Birmingham, Bradford, Sheffield, Holmfirth, and elsewhere. There had been a market for lanterns for some two hundred years, beginning with the instrument maker Richard Reeve in 1661, who learned of it from Huygens before making versions of his own and demonstrating the new instrument to Balthazar de Monconys and Samuel Pepys (Mannoni 2000 [1995]: 46-47; Bennet 2002: 371-372; Pepys 1983 [1666]: 119-120). But the later organisation of the lantern trade was different from the business Reeve had known.

Early lantern manufacturers were precision instrument makers dealing in microscopes, telescopes, and other optical devices for scientists and wealthy individuals. The businesses of the late nineteenth century most often specialised in lanterns or lantern slides. Rising incomes among certain demographics towards the end of the century allowed these businesses to sell to an increased customer base. The size of the market was far greater than at any point in the history of the medium, with major slide manufacturers such as Newton & Co. publishing catalogues listing thousands of slides. Far from the small-scale instrument trade of the later seventeenth century, where master craftsmen would personally meet potential customers and manufacture instruments to order (Bennet 2002: 371-379), the lantern trade of the late nineteenth century was more akin to a modern mode of retail, further expanding in the twentieth century and metamorphosing into new popular cultures. Lanterns, slides, illuminants, lecturing accessories, and interpretive readings were sold in large numbers to support a long-established exhibition culture.

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[2] Lucerna was created and continues to be managed by Richard Crangle (2014). It is an indispensable source on worldwide lantern collecting. Available at http://www.slides.uni-trier.de.

The lantern makers of the late nineteenth century inherited a media culture that was starting to multiply ephemeral and reproducible images of life. The lantern was one mode of circulating images that supported and competed with other types—photographic portraits, lithographic prints, illustrated newspapers, and, eventually, moving pictures. As a form of public exhibition, the lantern was part of a long tradition of popular entertainment that took on a variety of different forms—panoramas, peepshows, shadowplays, gallery exhibitions, public lectures (Altick 1978; Stafford and Terpak 2001). These, and other attractions, all established a clear frame of reference that integrated lantern projections into the everyday world.

There is a substantive body of literature exploring how this lantern trade operated. It is demonstrably different in both retail practices and scale of production from earlier iterations in the eighteenth and early nineteenth centuries. The late nineteenth century lantern trade was the first exploitation of optical media on an industrial scale. It established new approaches to the sale of technologies and images, and had significant and lasting impact on the public consumption of visual culture. Without the lantern trade, the motion picture industries, toy trades, domestic media, and public exhibition markets could not have developed as they did in the twentieth century. Despite the lantern trade's significance, there has been no research that explains its rise across the nineteenth century. This is because there has been little appetite to go back further, past the foundation of the major slide producers and exhibition venues, into an England of very different image-production capabilities and media networks. The first glimmer of a market for popular media appeared when images were experienced as printed papers—in chapbooks, broadsides, advertisements, and penny prints—or perhaps as transfers onto ceramic tiles, or copperware boxes. The lantern had lived at the margins of visual culture, but it became something quite different over a few decades at the beginning of the nineteenth century.

The principal aim of my research is to explain the emergence of an early English lantern trade between 1800 and 1830, and to use this to better understand the history of lantern practice across the century. I present three methodological approaches that inform how I assemble and interpret this history.

1. I will argue that the history of the lantern is itself made of many overlapping histories (of the instrument trade, popular entertainment, capital, retail, and public science).

2. I will show how the lantern is embedded into changing modes of practice (what I will call different paradigms, borrowing Andre Gaudreault's terminology, 2011 [2008]).
3. I will build these paradigms by uncovering the material processes and infrastructures that support lantern practice—that is, not only the history of a medium, but also of the various ways that it is embedded into broader material and economic life.

These are framed by the available material evidence, existing literature (its priorities, approaches and gaps) and current methodological thinking in historical media scholarship. They inform every part of my research.

III. Structure

The viability of a specialist trade was triggered by new approaches in the retail of optical media, responding to changing attitudes towards science and spectacle, by an expanding retail infrastructure, and by greater productivity among manufacturers. These enabling infrastructures supported the development of a potential lantern trade over the first half of the century, ready to coalesce around midcentury into the roaring commercial structures we know from 1860 onwards.

I will begin by showing how romantic stories of the early necromancers and Phantasmagores have shaped how lantern history was told. Lantern scholarship is led by key characters (Kircher, Huygens, Philidor, Robertson, Carpenter). The enduring resonance of these figures has led to decontextualised histories of individual brilliance. I want to make lantern history a matter of networks, their participants, and potentials.

I will then introduce Philip Carpenter and his new products, as others have, before expanding into wider commercial and manufacturing contexts. I will explain what Carpenter did and why he is considered a leading innovator (chapter 1). I will show what new modes of domestic lantern culture he and his network of contemporaries enabled (chapter 2), addressing methodological problems in social history and exploring his life and intellectual environment. Carpenter's practice took place in dialogue with shifting attitudes and economic conditions. In 1821 there was an appetite for new image-making machines. Where did this come from? And what new forms of media practice were enabled as a consequence?

I show that Carpenter was not the only person making lanterns at this moment. As I suggested in 'The Convergence of Science and Entertainment' (2017), this was an era when mathematical and optical instrument makers were all shifting into an

emerging popular market, with the lantern and other key optical instruments driving the way. Like other opticians, Carpenter was experimenting with new approaches to instrument retail. I will offer a more complex history of media practice by setting Carpenter in his trade context, revealing other retailers and instrument makers. I will introduce a forgotten instrument maker named Charles Blunt (chapter 3), who had developed many similar approaches to media retail some years earlier. We will explore Blunt's case and consider why Carpenter succeeded where he did not.

I will then move further outwards towards other trades and instruments (chapter 4). Beyond the instrument makers, there were networks of media practitioners profiting from similar modes of retail. The printmakers, engravers, and novelty retailers were all releasing optical trinkets of their own. All kinds of instruments and toys appeared over these decades. Some, like the Thaumatrope and the Phenakistiscope, have long been part of media history. But current scholarship removes them from their contexts. They were not optical toys—the same as a lantern or a Kaleidoscope. They were paper toys; printed novelties claiming the same market as the lantern, but produced by a different trade, with its own rules, history, aims, and major practitioners. The printers were an analogue trade responding to the same economic conditions as the instrument makers. I will consider how these analogue trades operated and how their history complicates the story of the emerging lantern trade. What was it about this moment that enabled retailers to produce new consumer media devices across several distinct practical networks?

Following this, I will return to the instrument that established the rules for optical media retail—the 1817 Kaleidoscope (chapter 5). I will reevaluate the Kaleidoscope in the light of my findings to show that it was powered by an extensive production and retail network. The Kaleidoscope experiment is only explicable in these terms. My work will challenge existing scholarship that fails to take account of the conditions that enabled its success. The Kaleidoscope was made possible by the Birmingham and Sheffield workshops. These minor practical networks powered the media revolutions of the era, producing new optical and paper toys and establishing new popular media trades.

Finally, I will consider the networks of workshops that made the new media technologies of the era. Examination of surviving instruments invokes a large production infrastructure of brassfounders, tin smiths, painters, and glass makers. Carpenter did not make his own instruments. He bought materials, outsourced production, and then stamped products with his own maker's mark (chapter 6). This discovery changes everything. If the instrument makers did not make their own

instruments, it forces us to ask different questions. No longer only: what innovative new techniques did they pioneer? but now: how did they manage their broader manufacturing and retail infrastructures? A history of innovation dissolves into concentric circles of anonymous labourers. I will explore the implications of the working networks for lantern history. I will show how longstanding lantern worlds among the itinerants and labourers were irrevocably changed by the commercial experiments of the era (chapter 7).

The lantern was also a tool of the poor. It lived on the backs of itinerant entertainers, and told stories of exploitation, unionism, and class warfare. Early tin lanterns were a vital part of a working-class and migrant culture. Increasing output potentials in the metal industries and toy trades helped the lantern transition into the developed retail landscape of the middle and later nineteenth century. The contributions of working people were ignored in favour of a story about individual genius innovators. As this transition occurred, the radicalism of an older lantern world was sanitised by consumerism. Working-class and itinerant lantern stories were appropriated and changed, or replaced entirely by practical education, landscape views, and empty comic scenes.

The standard explanatory model of consumer expansion ignores the economic cataclysm of the early years of the century. Only the wealthy could support new forms of optical technology. The working classes, the people actually responsible for the media revolutions of the new century, were faced with new modes of exploitation, increasing urban destitution, and further grinding poverty.[3] Their world was differently changing.

The magic lantern trade emerged over the nineteenth century, but its causes and implications are yet to be fully demonstrated in reference to wider social and economic realities. I want to open the lantern to new stories and voices that can reveal an everyday world beyond the great shining examples. This thesis will provide a contextualised history of the emergence of the lantern trade in early nineteenth-century England, attending to all of its messy and fragmented manifestations. I will pay particular attention to those voices and networks omitted from existing histories, revealing lost lanternists and anonymous practitioners. I will show how another lantern

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[3] Class is a slippery concept in the early years of the century. There had been an urban labouring class for some decades, but people did not yet self-identify through common experiences. They would not consistently do so until the 1840s (Thompson 1968). The middle classes were also developing a shared identity and would use their relationship with the market, consumerism, and work as components of a class consciousness. I will most often use class in the modern sense, identifying people who share certain relationships with political and economic life. But it should be noted that class is far from self-evident at this moment.

culture was squashed to the margins, sanitised, and resold for profit. The nineteenth-century lantern was capital made of optical knowledge. Its earlier lives now survive as a spectre haunting media history.

IV. Two Stories About the Magic Lantern

At the end of the eighteenth century the magic lantern was relatively unimportant. It had long since failed to command the attention of the natural philosophers and passed into the hands of migrant entertainers. Instrument retailers featured lanterns in their catalogues, but these were minor elements in their output. Overall, the magic lantern was viewed as a trifling, rather disreputable tin toy, not worthy of the respect shown to microscopes, telescopes, and other investigative instruments. It was not capable of generating new knowledge, as other instruments were, and so was accorded a secondary status by serious-minded purchasers. A catalogue of 1795 listed the device as an 'instrument of amusement and recreation', alongside 'the sensitive fishes', 'two curious mathematical cubes', 'an optical paradox', 'a magical well', and similar non-scientific devices (W. & S. Jones 1795: 10-11). These were kept separate from the experimental and professional instruments.

But its fame and popularity increased significantly between 1798 and 1834, through performances of the Phantasmagoria, new commercial versions of the lantern, and greater discussion of the instrument in literary and critical texts. This was the era that established the lantern's renown. I will begin by telling two stories of lantern necromancy, both well-known to writers, critics, and commentators of the early nineteenth century, and both influential on discursive framings of the newly-emerging consumer lanterns. The first is an episode from Benvenuto Cellini's autobiography, in which the artist pays a priest to perform a necromancy in the ruins of the Colosseum. The second story concerns the famous performer Étienne-Gaspard Robertson and the Parisian Phantasmagoria.

Robertson used an apparatus of lanterns and audio machines to simulate a necromancy much like the one supposedly experienced by Cellini. It relied on the relative ignorance of its audience with respect to mechanisms of projection, but later, after its techniques were revealed, became one of the most important discursive frames for the magic lantern. The Phantasmagoria made the instrument better known and helped structure how it was thought about. It offered a helpful point of reference for lantern retailers, who borrowed its name for their Improved Phantasmagoria Lanterns. It stood as a powerful myth to push back against. Retailers of the 1820s and 1830s commonly invoked the charlatanism of the ghost-raisers in their efforts to invest their

lanterns with educational and worthy connotations. Cellini's necromancer also reappears in various books of this period and is recontextualised in reference to the Phantasmagoria and changing knowledge of the lantern.

I will show how the reception of these two famous performances reveals something of the backdrop to the lantern's reemergence in the 1820s. The ghost-raisers eventually became something of an outlier in the consumer history of the nineteenth-century lantern, but they were influential for establishing the ground for a new mode of lantern culture. I will begin with these stories of technology-mysticism and demonstrate how they were rationalised by popular writers and commercialised by retailers. Following this, I will provide a critical reflection on historical methodology and show how this discursive ground was captured by the Improved Phantasmagoria Lantern of 1821. The problem I want to pose here concerns the construction of historical meaning: where did the early nineteenth century draw its knowledge of the magic lantern from? and how is our own knowledge, drawn from surviving fragments and incomplete histories, built in turn?

V. Cellini and the Necromancer

In the late summer of 1534 Benvenuto Cellini, the great Florentine sculptor, stood among the ruins of the Colosseum in Rome.[4] He had paid a necromancer to show him the secrets of their art. This man, a Sicilian priest, commenced a series of deliberate preparations, 'with tremendously impressive ceremonies' (1954: 121). He drew circles on the ground, in chalk, 'according to the custom of the necromancers' (1822: 230), and burned precious perfumes and asafoetida, 'of fetid odour' (1889: 141), to make smoke. Cellini brought his friend Vincenzio Romoli with him, and the pair observed the necromancer's preparations. When he had finished, and the air above the ruins was filled with 'noisome odours' (1822: 230) and 'evil-smelling stuff' (1954: 121), he broke the line of a large circle and, taking each man by the hand, introduced them into it. This circle would form a protective space, to keep the men safe in the trials ahead. He gave a pentacle to his assistant and began a series of incantations.

This lasted for over an hour and a half, but finally, at the necromancer's command, 'there appeared several legions of devils, insomuch that the amphitheatre was quite filled with them' (1822: 230). 'Benvenuto, ask them something' entreated the

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[4] This is a well-repeated episode from Cellini's autobiography, rendered in various translation over the years, each emphasising different aspects of his retelling. I have used several versions. Roscoe's translation of 1822 is most interesting for our purposes, as it presents the fantastic occurrences in language that suggests optical trickery. In contrast, contemporary translations prefer to draw out Cellini's untrustworthiness as a storyteller.

necromancer, seeing the space about the circle rapidly filling with demons. Hesitating for a moment, letting the ghosts rise before him, Cellini answered: ‘Let them bring me into the company of my Sicilian mistress Angelica’ (1822: 230). The demons remained silent. His mistress did not appear that night, but Cellini was satisfied with the conjuring of these spectres.

The necromancer asked the men to return the following night, and to bring with them a young boy. They did so, bringing Cellini’s apprentice, of about twelve years old, and a second friend, Agnolo Gaddi. The necromancer enacted a series of preparations, ‘with the same and even more striking ceremonies’ (1822: 231). He again commenced his awful incantations, calling, by name, multitudes of demons, in phrases of Hebrew, and Greek, and Latin; ‘and these he summoned by the virtue and potency of God, the Uncreated, Living, and Eternal’ (1889: 142).

The multitudes came to the Colosseum, until the amphitheatre was filled with apparitions a hundred times more numerous than before. These ‘were the most dangerous of all the denizens of hell’ (1889: 142). The companions were confronted by ‘a million tremendously fierce-looking men’ (1954: 122), while ‘four armed giants of an enormous stature’ (1822: 232) attempted to break into their protective circle. Vincenzio Romoli ‘quivered like an aspen leaf’ (1822: 233). Agnolo Gaddi’s ‘eyes were popping out of his head’ (1954: 122). The boy cried in terror: ’The whole Coliseum is in flames, and the fire is advancing on us’ (1889: 143).

Swallowing his terror, Cellini declared: ‘these creatures are only our slaves; all you can see is only smoke and shadow’ (1954: 122). He charged his companions to set about throwing more asafoetida on the fire. But, poor Agnolo, the instant he tried to move, ‘blew off and shat himself so hard that it was more effective than the asafoetida’ (1954: 123). ‘The tremendous stench and noise made the boy to lift his head a little’ (1954: 123) and, hearing Cellini laugh, he raised his courage and cast his eyes about the amphitheatre. He shouted ‘that the devils were flying away with a vengeance’ (1822: 234), and after some fearful moments, Cellini himself saw that the ghosts were each flittering away into the night air. The apparitions left them, but the anxious men remained within the circle until the sun rose, and a bell rang for morning prayers.

In the morning light, the necromancer concluded his ceremonies, removed his robes and gathered up a great pile of books. The men tentatively left the protective circle, huddling together, with the boy tucked between them. As they made their way home along the newly lit paths, the boy called out that two of the demons were visible in front of them, ‘leaping and skipping, sometimes running upon the roofs of the

houses, and sometimes upon the ground' (1822: 234). 'The necromancer said that he had often entered magic circles, but had never before witnessed anything on such a scale' (1954: 123).

VI. Rational Ghost-Raising

William Godwin, husband of the political philosopher Mary Wollstonecraft, claimed that these apparitions were brought to life by a magic lantern—a little optical projector, with fantastic pictures painted on glass. He writes:

> The whole of the demons therefore were merely figures, produced by the magic lantern (which is said to have been invented by Roger Bacon), or by something of that nature. (1834: 371-372)

The necromancer, Godwin claims, used the lantern as part of a cabinet of effects to simulate a summoning before his stupefied audience. There is no record of the magic lantern before 1659, so Godwin's account of its use by the necromancers, and his attributing of the instrument to Roger Bacon, is purely speculative. He situates the provenance of the lantern in an obscure history of alchemy, where this instrument and its principles were known as one element of a larger field of practice. The necromancer was one of Godwin's 'quacks, who in cool blood undertook to overreach mankind' (1834: 364), by exhibiting their knowledge of optical principles as occult magic.

'It is now known', Godwin claims, that Cellini's story 'was produced by optical delusion' (1834: 365). He says this without the least hint of uncertainty, casting no doubt at all on Cellini's telling of the story, which he seems to consider both accurate and unexaggerated (this is strange, given the autobiography's auto-hagiographic nature). Thomas Roscoe, translator of Cellini's autobiography, agrees with all of this, and is similarly assertive in his claim that the demons were produced by a lantern. In a footnote to Cellini's declaration that he and his companions were witnessing but 'smoke and shadow', he states:

> This confirms us in the belief that the whole of these appearances, like a phantasmagoria, were merely the effects of a magic-lanthorn, produced on volumes of smoke from various kinds of burning wood. (1822: 233)

Identical claims are repeated by Samuel Hibbert in *Sketches of the Philosophy of Apparitions* (1824: 401, 456).

The Phantasmagoria was an influential form of public performance that used a cabinet of optical techniques, including a concealed magic lantern, to simulate the conjuring of ghosts and devils. In the context of his era, it is natural for Roscoe to frame the event as a primeval Phantasmagoria. The modern Phantasmagores consciously adopted the myths and mannerisms of the necromancers and so, looking back, the nineteenth-century scholar sees effects to be attributed to familiar techniques and technologies.

Towards the end of the story, the boy claims to see two remaining demons, 'leaping and skipping, sometimes running upon the roofs of the houses, and sometimes upon the ground' (1822: 234). To the modern reader, familiar with projection technologies, this line is suggestive of a swinging lantern, projecting an image that flits back and forth across the surrounding walls, ground, and roofs. Godwin takes it as such:

> It is probable, that the magician who carried home with him 'a wallet full of books', also carried at the same time the magic lantern or mirror, with its lights, which had served him for the exhibition, and that this was the cause of the phenomenon. (1834: 372)

Whether or not Godwin and Roscoe are right (they aren't) is less interesting than their motivations for backwards-projecting a lantern into early modern history. Both require a modern explanatory framework to make up for a lack of documentary evidence.

Godwin casts the shadowy necromancer as a recurring figure throughout history, appearing intermittently whenever unexplained phenomena occur in ancient texts, biographies, or hearsay. Such exegesis was common in the early nineteenth century. Popular scientist David Brewster published his own *Letters on Natural Magic* to similarly intervene in a range of fantastic stories with modern scientific rationalism. In Brewster's book we again find our necromancer, with Cellini painted as 'the dupe of preconcerted imposture—the slave of his own ignorance—the prostrate vessel of power and superstition' (1832: 56). Brewster provides a lengthy exposé on modern optical techniques that can be used to deceive the ignorant. Also casting no doubt on Cellini's truthfulness, he explains:

> The legions of devils were not produced by any influence upon the imaginations of the spectators, but were actual optical phantasms, or the images of pictures or objects produced by one or more concave mirrors or lenses. (1832: 73)

Brewster postulates the necromancer's use of a cabinet of optical techniques, but does not implicate the lantern directly. 'In drawing this conclusion', Brewster says, 'Mr Roscoe has not adverted to the fact, that this exhibition took place in the middle of the 16th century, while the magic lantern was not invented by Kircher till towards the middle of the 17th century' (1832: 75). Brewster supposes the use of a concave mirror in a box containing the figures of devils; although without discounting the possibility of the necromancer somehow having use of a magic lantern a century before its formal invention (1832: 75).

We now believe that the lantern was invented by the Dutch natural philosopher Christiaan Huygens; not Kircher, as Brewster says, or Bacon, as Godwin says. One of Huygens' notebooks contains the oldest known description of a magic lantern (Huygens 1950 [1659]: 197; Wagenaar 2014 [1979]; Mannoni 2000 [1995]: 33-45). Huygens' complete writings were not available to the reading public until the end of the nineteenth century, and so Kircher and Bacon were widely given as plausible inventors.[5] Both writers' tendency to flit between vague generalisations and unsupported certainty are symptomatic of broader problems in their methodologies. Godwin and Brewster do not have the evidence to support their theses, and so they project a known set of practices and technologies backwards into history.

Neither have any understanding of the techniques employed by a sixteenth-century necromancer, nor the possible modes of retelling that Cellini may be employing, but they attempt to fill this gap with a set of practices that they know well. In Brewster's case, this was a modern system of optics that may have been known from ancient times, but was only very recently framed in a rational scientific discourse. In Godwin and Roscoe's case, this was a Phantasmagoria lantern, a major form of entertainment in their era. The lantern was so well known that it could be applied to historical practices about which nothing was known. The accumulation of modern knowledge about the lantern was enough to negate the losses inherent to historical scholarship.

VII. Loss

The lantern was regularly employed as description, or absent explanation, in a wide range of contexts (Bottomore 2005). A splendid ballroom could be filled with people

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[5] Books claiming Bacon as inventor of the lantern: Constable 1823: 172-173; Crabb 1830: 269; Kidder 1854: 43; Brewer 1846: 95. Books claiming Kircher as inventor: Oznam and Montucla 1813: 248; Park 1844: 357; Moffat 1842: 472; Steinmetz 1848: 248. Even with the aid of reliable documentary evidence, Kircher is still regularly cited as inventor today (Budd and Warner 1998: 365; Lindvall 2011: 44; Peres 2013: 803).

‘like dancing figures in a magic lantern’ (*The Fashionable World Delayed* 1805: 14); the aurora might fill the sky with colours ‘like an immense magic lantern’ (‘Aurora Borealis’ 1834: 97); a man could look back over ‘this long series of years, which have passed away like images reflected on the wall from a magic lantern’ (Stilling 1831: 387); even human perception could present images to the ‘inward mind as in a magic lantern’ (Hoffmann 1826: 3), or morality be a ‘magic-lantern of conscience’ (Maltravers 1822: 163). In each case it is used to grasp something larger, more mysterious or more beautiful than itself—nature or psychology or time. It provided a useful metaphor because it was known, and because it could summon ephemeral visions. It was a rational tool that could simulate the marvellous.

But the magic lantern is no longer so well known. It remains in the public consciousness as an evocative phrase but, like the Phantasmagoria, Kaleidoscope, stereotype, or panorama, has now detached from the apparatus it describes. The magic lantern has not been discussed in parliament since 1792, when the conservative minister John Courtenay accused Edmund Burke of wanting to use a magic lantern to raise the ghosts of ‘Paine! Frost! Carra! Marat! Robespierre, &c. dancing in a merry confusion’ (*The Parliamentary Register* 1793: 141). Even in media scholarship, the lantern often appears only as a precursor to more important media (Ceram 1965; Mannoni 2000 [1995]). But the lantern was not only a technological ancestor of the cinema. It had a culture of its own, with its own rules and practices. It was the most significant mode of visual communication across the nineteenth century. There is a growing field of literature that demonstrates this.

But there are many more historical accounts that seem unaware of the lantern’s existence. This lack of historical visibility is a result of the lantern’s own ephemeral nature. It was a performance technology. Its history was unevenly preserved because it has no recording capacity. Lanterns and slides survive as material artefacts, but their use by lanternists was poorly documented. Reports of lantern shows exist, but these barely ever come with surviving objects or images, to show how they were used. In almost all cases, half of the story is missing. Zielinski has approached this as the problem of ‘deep time’ (2006 [2002]). Historical scholarship imposes explanatory frameworks; it does not reveal an unmediated view of the past. At the edges of our histories there are other, unseen territories that rupture teleological narratives with contradictory or obstructive fragments. These may fall outside the standard retellings of media history. They may be everyday practices that left no trace, but which were intimately connected to our reconstructed histories.

Social history and theatrical history have long been dealing with problems regarding the survivability of events, but media historical methodologies are poorly equipped to deal with ephemeral media. The best researched media (cinema, photography, recorded music, transcribed music, print) are recording technologies. They survive as complete reproducible works that can be known and studied. Other ephemeral media (television, radio) pose similar problems of historical loss, but are better archived and documented, because they are more recent, and were studied in their own eras. In all media, there is loss in the conditions of production, distribution, and reception, but the hegemonic recording media of cinema, photography, music, and print, allow the fiction that they are complete artworks.

The lantern poses a challenge to media history. It confronts us like the lives of the necromancers; illuminated in brief brilliant flashes, but spiralling away in an obscure network of practices and minor events that we can no longer trace. The fragments of the past emit their own light, as Zielinksi says (2006 [2002]: 13), but they do not always reveal the ground around them. A surviving lantern, slide, catalogue, or news report may reveal, in brilliant luminosity, a single moment in the history of media. But it will not explain how it was embedded in a larger world—how a lantern was made and used, how it was thought about, and the conditions that enabled it.

VIII. Phantasmagorae

> On 4 germinal [24th March], I found myself with about 60 others in a well-lighted apartment at no. 18 Pavillon de l'Echiquier.
>
> At precisely 7 o'clock a pale, gaunt man entered the apartment where we were: after having extinguished the candles, he said:
>
> 'Citizens and gentlemen, I am neither one of those shameless adventurers, nor one of those impudent charlatans, who make promises they do not keep. I have assured the public in the *Journal de Paris* that I have resuscitated the dead, that I will bring them back to life. Those in the company who desire the apparition of persons whom they hold dear and whose life is terminated through illness or some other respect, now is the time to speak: I obey their command!' (Poultier-Delmotte 1798; Hecht 1993: 58)

250 years after Cellini, a conjurer of a different sort stood in the darkness among a scattered, hushed audience. Étienne-Gaspard Robertson, a dramatist with an appetite for the occult, had drawn a crowd to witness his performance of the Phantasmagoria.

Having caught their attention with his opening speech, he breathed deeply and waited for a reply to arrow back at him.

> Then followed a great silence; whereupon a man in confusion, his hair bristling, the eyes sad and wild, *la figure arlésienne*, said: 'since I have been unable to establish the cult of Marat in an official journal, I would at least like to see his spirit'. (Poultier-Delmotte 1798; Hecht 1993: 58)

Robertson smiled and bowed gracefully, then flicked his eyes towards the blackness beyond him. There, unseen by the captivated crowd, a sheet of calico was stretched between two walls.

> Robertson poured two glasses of blood, a bottle of vitriol, a dozen drops of *aqua fortis* and threw two copies of the *journal des Hommes-Libres* on a flaming brazier. Instantly, little by little, a small, hideous, and livid phantom, armed with a dagger and covered with the red cap of liberty appeared. (Poultier-Delmotte 1798; Hecht 1993: 58)

A second man crouched in the furthest depths beyond the calico screen. He halted his breath and raised the flame on an Argand lamp inside a huge wheeled machine. This was a Fantascope: a hidden magic lantern to throw figures on the screen. Martin Aubeé, Robertson's assistant, had slipped a painted glass slide into the lantern's slide stage and illuminated its inner chamber. The light from the oil lamp was intensified by a condenser lens before passing through the tiny painted ghost, trapped in a tunnel of light, feet in the air, still waving a dagger about its head. An objective lens completed the condenser's work, throwing the ghostly figure, now turned upright, onto the calico. And there it floated in miniature; the secret screen presenting the ghost to the astonished watchers. Aubeé pulled the Fantascope backwards. Its wheels clicked and followed a narrow rail across the floor. Little by little, the machine moved away from the screen, and the small, hideous, and livid phantom grew steadily to the height of a man. The wild-haired youth was certain he had seen it appear at the end of the room and walk slowly towards him. His eyes did not see that the room was not so long as it appeared, nor that the ghost barely moved. It shifted in jerks, as Aubeé slid a second glass pane over the slide. It moved with unreal convulsions, and the graveness of death.

> The man with bristling hair recognised him as Marat; he wanted to embrace him; the phantom grimaced horribly and vanished. (Poultier-Delmotte 1798; Hecht 1993: 58)

At the end of the eighteenth century, projected occultism was still powerful enough to draw audiences. The magician Philidor had presented a range of techniques that used lanterns, smoke, music, performance, and decoration to conjure ghosts and demons before a paying audience (Heard 2006: 56-84; Mannoni 2000 [1995]: 141-147). A Fantascope lantern on wheels was positioned behind a screen and rolled backwards and forwards to make an apparition appear to move towards and away from spectators. Smaller handheld lanterns were used to make spirits flit about the space. Clouds of smoke would make images hang in the air. A hidden musician coaxed sounds from a glass harmonica. A performer recited incantations and summoned each vision in turn, as Cellini's necromancer had. The result was a multimedia performance that presented horrifying spectres before the audience.

This was first exhibited in 1792, at the Hôtel des Chartes in Paris, and named the Phantasmagoria (Mannoni 2000 [1995]: 141-142). This exhibition utilised many of the same effects that Godwin claimed of the sixteenth-century necromancer. It was wildly popular and soon copied by others, including Robertson, who adapted Philidor's multimedia séances into a self-reflexive elegy for Revolutionary France.

The descriptions of Robertson's performance are from a satirical article in *L'Ami des Lois.* The report is every bit as unreliable as Cellini's colourful account, but it helpfully reveals the discursive similarities of this modern ghost-raiser. There is the same grand theatricality; the same monologue incantations; the same fearful awe of emerging spirits. Later in the performance, a young man calls for 'a vision of a lady he had tenderly loved', who emerges from the smoke produced from 'sparrow-feathers, a few grains of phosphorus and a dozen butterflies upon the brazier' (Poultier-Delmotte 1798; Hecht 1993: 58-59). Like Angelica, she is voiceless, but transfixes the man with a 'tender and mournful stare' (Poultier-Delmotte 1798; Hecht 1993: 59). In contrast, appear the ghosts of William Tell and Voltaire, now speaking in clipped aphorisms. Cellini's ghosts spoke only through the necromancer. And the necromancer raised only Angelica and the anonymous legions, where Robertson was inclined to conjure the recently murdered Marat or the spirit of Virgil. Cellini's story invoked an ageless dread of the supernatural, whereas Robertson, the modern necromancer, twisted the afterlife to reflect the audience's own world—revolution, Enlightenment, and the dead king.

> He asked Robertson whether he could make Lois XVI appear? At this indiscreet question, Robertson replied firmly and sensibly: 'I had a recipe for this sort of thing before 28 fructidor; it was during that time that I lost it. It is probable that I cannot ever find it again, and it is

> therefore henceforth impossible to bring back the Kings of France. (Poultier-Delmotte 1798; Hecht 1993: 59)

Necromancy had become a mirror of its audience. A ghost's arrival, or its absence, could be political satire.

But the clearest difference is the absence of old necromancer's apparatus. The poverty of the historical record was such that Godwin and Brewster fabricated a cabinet of optical effects for the necromancers. In contrast, media historians know everything about Robertson's techniques. There is a patent for the Fantascope that shows Robertson's techniques (1995 [1799]; Mannoni 2000 [1995]: 153-157) and a report by two scientists, Pierre Jamin and Jean François Richer (2000 [1800]), that dispels the mysteries of his ghost-raising. Robertson published his own *Mémoires* in the 1830s, providing commentaries on his methods (1831-1833; Robinson 1986). Earlier books by Edme-Gilles Guyot (1769) and Johan Samuel Halle (1783-1786) provided advice on using optical instruments to conjure marvellous visions. Both texts were inspirations for Robertson and Philidor. In Cellini's day the customs of the necromancers were carefully guarded secrets, for the success of their performances depended on this. By the later eighteenth century, there were numerous reports outlining phantasmagoric techniques (Decremps 1784: 105-107; 'La Phantasmagorie' 1793; Poultier-Delmotte 1798; Hecht 1993: 58-59). Cellini's necromancer would never have revealed his methods in an official patent. Robertson, for his part, attempted to hide his techniques, but succeeded for less than three years.

Robertson's Fantascope patent was motivated by his desire to safeguard his cabinet of techniques from imitation. Confronted with rival showmen, he attempted to legally protect his preeminence. This did not work. Martin Aubeé established his own performance, the Fantasmaparastasie, under the patronage of businessman Léonard André Clisorius. Robertson appealed to the police to have their equipment seized as counterfeits, in violation of his patent; Aubeé and Clisorius responded by taking Robertson to court to have the confiscation overturned, revealing the self-professed inventor's debt to the innovations of Philidor and Guyot (Mannoni 2000 [1995]: 165-171). The court case nullified Robertson's patent and the subsequent report by Jamin and Richer revealed everything.

New Phantasmagores emerged like ghosts. In Paris, the Improved Fantasmaparastasie was opened by a conjurer called Olivier; Rouy Charles ran a Phantasmagoria at the Palais Royal; the 'Psychagogie, or evocation of ghosts and the phantasmagoria' opened at the Abbey of Saint-Germain; and the ventriloquist Louis Comte established the 'historical animated phantasmagoria' (Mannoni 2000 [1995]:

172-173). In America, ‘the tremendous spectacle of Phantasmagory’ opened at the Mount Vernon Garden in New York and Tomlinson’s Skiagraphic Phantasmagoria at the City Hotel. Martin Aubeé hosted a Phantasmagoria at the Columbia Museum in Boston (Barber 1989: 78-81; Musser 1994: 25-27). In London, Paul de Philipsthal established a tremendously successful Phantasmagoria at the Lyceum (Heard 2006: 134-142).[6] He was followed by M. St. Clair at the Royalty Theatre, and a demonstration of optics by a Mr. Jones, instrument maker and artist’s supplier of Wells Street, who presented an ‘entire new, superb and brilliant display of Emblematical and Allegorical Fireworks’ in the same manner ‘as has met with such wonderful marks of approbation at Vienna, Paris and London, under the title PHANTASMAGORIA’ (Heard 2006: 144-149). Robertson complained that Paris now ‘resembled the Elysian Fields for the large number of ghosts living there’ (1831: 320-321; Mannoni 2000 [1995]: 172).

Modern necromancy took place in a different culture. Robertson’s secrecy was undone by the legal system of patents, the publishing landscape, and communications systems. Secrecy was a more difficult matter in this age of unfolding media networks. But he could, for a time, exhibit optical effects to an ignorant audience. Spectators would have known that he was presenting a technical trick of some kind (they were not stupid), but the rules of the game remained opaque. Even after Robertson’s techniques were revealed, Phantasmagores could still find a general audience not cognisant of the Phantasmagoria, or even the lantern, which was not yet an everyday encounter. Three decades later, the lantern was well-known enough, at least among readers of popular scientific texts, that Godwin and Brewster could posit the lantern (or the concave mirror, lens, prism, camera obscura) as the absent cause of centuries of necromancy.

IX. Material Fragments

There are surviving instruments that testify to the adoption of Phantasmagoria techniques across Europe: two wheeled Fantascopes in the Cinémathèque française (Brooker 2015; Mannoni 2015), another in Thomas Weynants’ collection, two in the Museu del Cinema, and two in François Binétruy’s collection. Binétruy has another two smaller Fantascopes, as does Erkki Huhtamo. There are also many slides and accessories that show the tools of the Phantasmagores. Weynants found a skeleton puppet emerging from a coffin, made by the Molteni company, hidden away in the

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[6] Mervyn Heard argues that Philipsthal was the original Philidor himself (2006: 116) who, having fled the revolution, moved to London and began exhibiting again after the Robertson affair. This seems likely, in light of the evidence presented by Heard, but the conclusion is questioned by Mannoni (2000 [1995]: 173) and Huhtamo (2006: 11-12). Both conclude that it is possible, but not certain.

Château de Moisse, to be used with an enormous Fantascope (Weynants 1997). The Museu del Cinema has a papier-mâché skull from a Phantasmagoria cabinet, set into a torch so the mouth and eye sockets glow in the darkness. Referring the surviving material record to surviving documents provides a portrait of this moment in media history. Numerous scholars have used these resources to resurrect the Phantasmagores (Levie 1990; Heard 2006, 1996, 1997, 1999; Mannoni 2000 [1995]: 136-175; Hecht 1984; Robinson 1986; Wilkie 1895; Bollaert 1983).

The distribution of equipment emphasises the broader landscape of performances, which could be obscured by the documentary emphasis on Robertson. Thomàs Mallol, former owner of the Girona collection, claimed that he had acquired some of Robertson's own equipment, as did French collector Jac Remise (both claims are possible, but unsupported), but all other surviving objects were used by unnamed performers, and most are dated to decades after the Phantasmagoria cycle had passed. The Molteni equipment found by Weynants was sold into the 1890s (Molteni 1892; Weynants 1997). One of the Girona Fantascopes was part of a general cabinet of physics, bought by a Spanish school in the 1840s (Pons and Pitarch 2017). Other scholars have identified rival performers across the world (Barber 1989; Mannoni 2000 [1995] 165-171; Heard 2006: 144-192). These discoveries run counter to the apparent exceptionality of the famous ghost-raisers. There were a great deal more Phantasmagores than Philidor and Robertson, but other, less renowned lanternists do not cast their shadow over media history.

Robertson himself was a kind of historian. He engaged with the recent past of the French republic and popular Enlightenment thought. He used an ephemeral medium to capture events and characters in time; each appearing in scattered moments of light and sound; each lost to the present but reconstituted through optical technology and historical knowledge. He understood that the lantern could be a machine to raise the ghosts of history.

The magic lantern remained a relatively niche concern at the beginning of the century. Lanterns were sold as optical curiosities and parlour toys, but people were most likely to encounter its projected effects in a theatrical performance or in the hands of a street peddler. The Phantasmagoria, if only as discursive concept or emblem of the new century, was becoming very famous indeed. Famous enough for it to feature in one of Baron Munchausen's adventures:

> When I was last in Paris, I observed the delight with which the people of that gay capital thronged to the theatres, to behold ghosts, mouldering castles, battles, and in short, a combination of horrors, which excited the

> terror of the audience, by powerful stage effect. This species of amusement is what my friend M. Mercier, in his *Fableau de Paris,* calls the *phantasm agony.* As I knew the English delighted in marvellous and terrific exhibitions, I brought over a magic lantern, on a new construction, and presented it to M. De Philipsthal, who has since successfully raised imaginary spectres with it under the curious name *Phantasmagoria.* (1802: 84)

The performances did not stand alone in the popular consciousness. They were imagined in vast technical cabinets of optical instruments and mechanical wonders. The modern scientific cabinets evoked Godwin and Brewster's conjectured necromancers. Compare a conjurer imagined by Tobias Smollett: 'this tenement being furnished with the apparatus of a magician, such as globes, telescopes, a magic lantern, a skeleton, a dried monkey, together with the skins of alligator, otter, and snake' (1815: 192); to the modern optical instruments:

> On these and other principles demonstrated by this science, the camera obscura, the magic lantern, the phantasmagoria, the kaleidoscope, the heliostata, the micrometer, spectacles, opera-glasses, prisms, microscopes, reflecting and refracting telescopes, and other optical instruments, have been constructed, by means of which the natural powers of human vision have been wonderfully increased. (M'Colloch 1827: 241).

The lantern straddled the gulf between rational science and popular spectacle. The undecidability of the lantern, where it is both optical and magic lantern, is the problem that spirals around the entire discourse of lantern culture at this moment. The lantern is both rational and magical. It took this duplicity into the next phase of its life: when this minor instrument in the optician's catalogue, or one exhibitor's device among many, became the media network of the century.

X. Ephemera and Capital

The Phantasmagoria attained remarkable visibility among the literate and theatre-going middle classes. It travelled the world, as the early lantern had done a century and a half ago, and the Cinématographe would do a century later. But it alerts us to the fissures in the historical record. We have seen how the material evidence suggests a field of minor practitioners. Scholars have followed this to uncover rival lanternists and reveal its many scattered uses.

Lantern history is shaped by the medium's ephemerality. In its own era it was driven by capital and the broader economic context of the moment. These two concepts—ephemerality and capital—are little appreciated by the existing literature, but both are crucial to the history of the nineteenth-century lantern. They are ghosts in the machine, so to speak.

The lantern has no recording function and suffers from a politics of survivability, like all social history. Robertson dominates the story of the Phantasmagoria because he had the authority to drive the discourse. Philidor is less known, but was famous enough to recur as a phantom precursor. Aubeé and Clisorius invoked Philidor to dismantle Robertson's patent, and would, in their performances, present the ghost of 'Filidor […] crowned by the grateful fairy' (Mannoni 2000 [1995]: 167). Much is known about the great showmen, but little about Jones' optical tube, or the effects of his Allegorical Fireworks. To leave a mark in history is a privilege or an accident. But the material evidence in hundreds of collections shows that the medium was dominated by anonymous lanternists and ephemeral performances. How can we know these people?

Robertson framed his Phantasmagoria as a means of lifting the veil of superstition from the old necromancers. He claimed in an advertisement:

> Robertson is a scientist, engineer, painter, optician; he is all that he has to be to work the greatest effects on the imagination through the senses, except that which he does not wish to be, magician, necromancer, in a century where all those tricks have vanished before the reason of man (Mannoni 2000 [1995]: 151).

But he rarely offered more than a cursory explanation of his optical effects. The duplicity of lantern discourse, where wondrous impulses were sutured by rational language, concealed a vulgar secret still more terrible than the ghost of Marat: Robertson was a business man. He patented the Fantascope to protect his earning power. Jamin and Richer accentuate this point in their report:

> A dispute has arisen between two operators of optical illusions concerning the instruments and methods which they use to produce these illusions of pure charlatanism. We apply this name to effects which, without advancing a single step or making any progress in the pursuit of the sciences, serve only to capture the admiration and above all the money of the public, to whom they are careful not to explain the causes. (Mannoni 2000 [1995]: 171)

Economics is the absent cause of all nineteenth-century media. Scholars are fascinated by the beauty and ingenuity of the lantern, and so tend to address its aesthetic and technical aspects. But the history of the lantern, of the expanding commercial infrastructure that makes lantern culture possible, is driven by capital.

My research is animated by Walter Benjamin's material history of the century. For Benjamin the century was capital. In his *Passagenwerk* (1999 [1982]) he constructed a framework for the study of an unfolding nineteenth-century capitalism, attentive to the ways that capital was embedded in material things. Benjamin shows how new modes of production drove consumer expansion and how new forms of experience sprung up to contain and exploit the consumer society. The arcades of Paris created a framing device for commodity capital. Elsewhere, the workshops of Birmingham, Sheffield, and Nürnberg expanded and intensified production, responding to the new appetite for consumer goods. In London, a network of exhibition venues solidified to capture a pleasure-hungry mass of spectators and take advantage of emerging optical technologies. Benjamin shows how the century embedded its economic expansion in lived experience. People did not witness this economic reality as the movement of capital, or the output of goods, or the great inventions of the age, but as many scattered and fleeting, ephemeral experiences.

XI. The Piling Wreckage of the Nineteenth Century

For Benjamin, the psychological effects of the media networks were a series of Phantasmagorae:

> The new forms of behaviour and the new economically and technologically based creations of the nineteenth century enter the universe of a phantasmagoria. These creations undergo 'illumination' not only in a theoretical manner, by an ideological transposition, but also in the immediacy of their perceptible presence. They are manifest as phantasmagorias. (1999 [1939]: 14)

There is a hint of metaphor to this pronouncement, whereby all kinds of novelties and visual pleasures are 'illuminated' as lived experience. But as Margaret Cohen has argued, there is a deeper logic to Benjamin's choice of the lantern as a visual parallel for the century. This was not only a Phantasmagoria of ideological mystification, hiding the true relations of people to society, but also an apparatus for the production of new sensations (Cohen 1989: 88-90). For Benjamin the Phantasmagorae of the marketplace, entertainment industry, and interior self, are derived from concrete forms.

They are not ideological concepts, but real, material things. ‘The world is an endless series of facts congealed in the form of things’ (1999 [1939]: 14). His project was to develop a method for recapturing these things; to connect fleeting experience to its material foundations. Benjamin understood that modernity was experienced as ephemeral time, but that it was produced by a material infrastructure. The arcades, Benjamin’s archetypal commercial form, were made possible by modern innovations in glass, iron, and textiles. The Phantasmagoria was an apparatus for the production of ephemeral experience, and so he seized it as a concept to describe the material and ephemeral duplicity of modernity.

The principle structure that embedded experience in material life was the commodity and the marketplace. As Tom Gunning shows, Benjamin’s concept derives from Theodor Adorno’s thinking, where the Phantasmagoria is a consumer item that no longer shows how it came into being (2004: 11-13); capitalism projected like a phantom into the arcades. Benjamin’s attempt to reconnect the Phantasmagoria of capital to its material structures leads him to studies of iron and glass production, architecture, town planning, lighting technology, advertising, lithography, photography, painting… Ultimately there were too many connections for Benjamin’s qualitative economics. He could produce a framework for a material history of nineteenth-century capital, but left his monument unfinished, fleeing occupied Paris as the piling wreckage of a new century drove him from the documentary fragments he had assembled in the Bibliothèque Nationale.

Cohen and Gunning are attentive to the way that the Phantasmagoria helps Benjamin frame the history of consumer capital, but they do not explain how the concept may affect our understanding of the Phantasmagoria itself. It was, like all media, built on a material foundation of instruments and techniques. When Robertson attempted to remove his rivals, he did so by challenging their rights to use his patented equipment. Benjamin’s framework emphasises the extensive reality of material infrastructures. Iron production, innovations in glass and lighting technology, the marketplace, and the arcades themselves, are all enabling structures. The things that made the Phantasmagorae possible were not only machines and equipment, but also the commercial networks that created a place to exhibit and the production networks that built and sold the Fantascopes. Media require many enabling infrastructures. This is the subject of the opening sections of the *Passagenwerk*, which seek to establish the enabling conditions of consumerism. The answers come through a polyphony of voices that recount different experiences and tendencies. The arcades frame commercial practice in physical environments: they are material structures that enable participation in fashion, novelty, sensation, and all manner of ephemeral experiences. The arcades,

in turn, are structured by material possibilities and networks of production and exchange.

XII. The Operational Ground of Lantern Culture

And the lantern, too, as it moves through the decades, is framed by material networks of production and exchange. Its success is enabled by different technologies and embedded into different intellectual and performative contexts. Its history is driven by the creeping expansion of these networks. By the end of the century the lantern was everywhere. The importance of the lantern is signalled by numerous studies that show how popular projection helped define the conditions of thinking across the century. Various scholars have shown how new media formations reframed lived experience (Crary 1990; Groth 2013; Flint 2000; Gabriele 2016; Kittler 1999 [1986]). There are now well-defined technical histories of media that situate the lantern in longer chronologies of projection (Mannoni 2000 [1995]; Rossell 1998; Liesegang 1986) and many scholars who have set the lantern in its performative context, tracing the history of its images and exhibition (Household and Smith 1979; Humphries 1989; Crompton, Henry and Smith 1986; Wagenaar, Wagenaar-Fischer and Duller 2014a; Waddington 2003; Borton and Borton 2015; Hoffman and Junker 1982). There is much fine research on the lantern, but most scholars neglect the material infrastructures that make lantern culture possible.

The existing literature provides little explanation for the changing uses and conceptual status of the lantern. In most studies, optical media is used as a means of explaining visible patterns in literature, art, or philosophy, or shown to exist in its own moment, with little consideration as to how it was historically enabled. Visual entertainments are taken as something that simply exist. No one has questioned why the lantern, or any form of optical technology, should exist in a given form, or why it should elicit its documented experiential responses.

This raises a series of questions which form the basis of this research: how were the latest iterations of the magic lantern in the 1820s different? How did they herald new retail strategies, and new modes of manufacture? How were lantern practice and lantern discourse influenced by earlier lantern myths—of ghosts, necromancers, and charlatans—and how were these in turn driven by material structures buzzing back and forth between retailers, manufacturers, and exhibitors? How, finally, are all of these things imperfectly known to historians right now? How is the story that we have told twisted and distorted by longstanding obstructions?

The crucial factor, in my eyes, as in Benjamin's, is the underlying infrastructure of nineteenth-century media. There is an operational ground to these media that is not addressed by most scholars of nineteenth-century culture. Attitudes towards visuality change in the nineteenth century because the modes of producing visual content, the trades and retail networks in place to enable these things, are also changing. The lantern becomes a significant commercial object because a lantern trade was set up to exploit it. Where this trade came from, how it operated, and what its ongoing effects were has not yet been fully explained.

> The English people are greedy of novelty; childish in this alone, it makes no great distinction between good and bad, they want only what is new. They pay for the magic lantern, and pay well, but they always want fresh figures. To feed this insatiable whale, that always pants with open jaws—
>
> 'And after meals is hungrier than before'. (Pecchio 1833: 154)

Methodology

I. A History of Practice

Lantern history is best told through surviving objects and documentary fragments. There is now a large body of literature, with many scholars and collectors striving to understand what these objects were, where they came from, and how they were used. Lantern scholarship has progressed through small articles on different aspects of the medium, published in society journals and edited collections (Crompton, Henry, and Herbert 1990; Crompton, Franklin, and Herbert 1997; Crangle, Heard, and van Dooren 2005; Crangle and Vogl-Bienek 2014).[7] They may discuss a particular object or moment in the history of the lantern, or establish trajectories for short histories. For some time, the leading contributors were collectors and so the visibility of slides and equipment in private collections has been key to defining research questions and suggesting the shape of lantern history. The result is that much research is object-focussed and limited to isolated moments in time.

There is no synthesis; the resources that best represent an overall history are the *Encyclopaedia of the Magic Lantern* (Crangle, Herbert, and Robinson 2001) and Herman and Ann Hecht's *Pre-Cinema History* (1993), a compendium of documentary sources. Between these texts emerges a reliable picture of current knowledge and available primary documents (more recent findings excepted). A fairly complete understanding can be discerned from this, but both present only fragments of knowledge, without a coherent critical framework. This is in keeping with the fragmented nature of lantern scholarship. There are several texts that attempt more extensive histories, providing detailed studies of particular modes of projection (Heard 2006; Vogl-Bienek 2016; Eifler 2017), individuals (Borton and Borton 2015; Hoffman and Junker 1982), or institutions (Brooker 2013), that are bounded by time (Rossell 2008; Wagenaar, Wagenaar-Fischer and Duller 2014a), or place (Waddington 2003) or

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[7] There are three important journals dealing with the lantern: *The New Magic Lantern Journal* (1978-2014), its successor *The Magic Lantern* (2014-present), both published by the Magic Lantern Society of the United Kingdom, and *The Magic Lantern Gazette* (1989-present), published by the Magic Lantern Society of the United States and Canada.

that address the lantern's history in the context of cinema and other media (Mannoni 2000 [1995]). There is no single history, but many intersecting threads that follow particular uses or individual manufacturing and exhibition contexts.

Each historical moment only imperfectly joins up with others. Those scholars who have attempted chronologies of the lantern have continued to work in fragments, shifting rapidly between times, individuals, and organisations (Harrison 1887, 1888; Barnes 1997; Robinson 1990; Hecht 1980, 1984a, 1984b; Frutos 2013; Fenton 1990), or separating a history into loosely-connected phases (Rossell 2008; Heard 2006). In many cases, there is little connecting the different forms of lantern practice documented in the literature. There is no demonstrable relationship between scientific and concurrent itinerant use of the lantern in the eighteenth century. Similarly, while the Royal Polytechnic Institution was undoubtably famous (it is highly visible in the discourse of its own era and modern scholarship), its relationship to the commercial lantern trade is not clear. Its success may have inspired popular use of the lantern, but this has not been demonstrated. In each case there is a rupture between different moments. Moving in leaps between fragmentary stages, drawing piecemeal histories from a great wave of minor historical scholarship, researchers have neglected to interrogate the robustness of the history unfolding aound them. This approach has been common to media history since the nineteenth century.

The only thing that all of this research has in common is that it describes some use of a magic lantern, as retail, exhibition, or symbolic device. But there is little demonstrable continuity between the different phases of its use over some 250 years. The different manufacturers, retailers, and exhibitors did not use instruments that were causally related to each other. A toy lantern, dissolving triunial, itinerant's bullseye lantern, or Fantascope are not related instruments. They were not used in the same way, their users did not want the same things, nor were they part of the same traditions or material networks. We call all of these instruments magic lanterns, but only because they share similar technical principles (lenses, slides, illuminants, etc.). Collating all of these very different things cannot comprise a history because there is no history of the magic lantern, only individual histories of particular magic lanterns.

I propose that we reframe the problem as a history of lantern practice; that is, of variable applications of a field of knowledge and techniques. Different individuals responded to an assemblage of practical knowledge that developed gradually and was communicated through objects, illustrations, treatises, apprenticeships, and performances. They all learned something about the lantern and tried to exploit it in different ways. Practical knowledge was integrated into particular frameworks: an

instrument manufacturer may learn of the technical specifications for a lantern and add it to their repertoire; a travelling entertainer may learn of its usefulness for short performances; a printer may learn of its popularity and publish many original slides for purchase. Each is situated in a distinct framework with its own aims, traditions, and practices. A history of the lantern can only be a history of its use by the scientific instrument trade, travelling entertainment tradition, exhibition halls, toy makers, magicians, scientists, and preachers—all connected through a flexible mode of practice that comprises the accumulation of knowledge and techniques required to make and exhibit the magic lantern.

This approach is understood by Ian Christie, who proposes a study of lantern practice in dialogue with the material evidence provided by lantern technology (2007, 2014: 205-206), and Charles Musser, who proposed a concept of 'screen practice' to expand early cinema scholarship towards a broader screen media, defined by continuity in approaches rather than differences in technologies (1984, 1994: 15-54). Cubitt frames the history of media as the study of related modes of practice (2014), while Rossell shows how the technical development of media is only possible within a broader framework of cultural practices (1998, 2014). As these scholars demonstrate, there is a history of practical knowledge, of manufacturing techniques, and mechanical solutions from which concrete technologies emerge.

We have to understand how the lantern was embedded in wider frameworks. This may mean looking to cultural history to consider people's expectations of media systems, or it may mean looking for variations in manufacturing practice, or approaches to public exhibition. The integration of a lantern into each paradigm is almost incidental, as it forms only a minor part of these larger fields of practice. We must see how it has been differently approached, interpreted and exploited. What made so many people take up the principles of lantern projection as a useful way of fulfilling their own aims (which could be making money, teaching, storytelling, or preaching)?

Lantern practice often lacks direct continuity between paradigms. Some scholars, in an effort to reject linear chronology, have been content to separate individual moments and leave each to stand as irreducible and unconnected points in a general constellation of historical media (Zielinski 2006 [2002]). This would do justice to the fragmentary nature of lantern scholarship and provide a platform for exploring the unique conditions of each manifestation of lantern practice, but it would not produce any explanations for the development of the wider trade. I would like to maintain the connectedness of different paradigms and seek out obscure commonalities between each manifestation. Principally, this concerns the structural and material conditions of

lantern practice—the networks that make exploitation of lantern technology possible, and that are common to different modes of practice in manufacturing, retail, and exhibition. I will show how material evidence can uncover a substrata of media practice. This may include the commercial networks that make the circulation of lanterns and slides possible, the exhibition networks that provide places for lanternists to perform, the economy of skills and labour that manufacturers must navigate to produce lanterns, or the rise and fall of income demographics and local economies that provide the disposable capital for people to enter the lantern market. There is a wealth of structural causes that explain different aspects of lantern practice and the changing nature of the trade.

This will result in a messy, non-linear history. I will proceed in stuttered advances, describing particular modes of media practice and only revealing a larger picture as the evidence accumulates. I have identified a key moment in the appearance of the Improved Phantasmagoria Lantern. I want to understand this by approaching it through multiple paradigms, in order to show how this instrument connected with changing attitudes towards science, new manufacturing capabilities, and wider retail strategies. I want to understand how it enabled new modes of domestic and professional performances, how it relates to other emerging media technologies, and how, over many decades, it snowballed into a larger trade. I will layer minor paradigms on top of one another, proceeding in the fashion that lantern scholarship itself has proceeded, but carefully selecting each to illustrate aspects of structural continuity. A new Phantasmagoria Lantern was a marker of various retail, manufacturing, and performative practices that emerged in the first few decades of the century.

II. Material history

Given the substantial gaps in the historical literature and the large body of material evidence available, I have made use of material analysis to produce new knowledge on the history of the lantern. This has uncovered different modes of practice and their underlying conditions. Here, I will suggest collections-based approaches to lantern history and show what kind of minor historical information objects can produce. In the following sections, I will expand outward from the micro-histories of close material study and outline my methods for connecting individual moments into more extensive histories of lantern practice.

I adopt this approach as a means of making the best use of my resources. At the Media Museum (Science Museum, Bill Douglas Museum, and elsewhere) I enjoy a larger dataset than most lantern scholars. So I have developed working practices that

capitalise on the relatively unusual situation of having a period of several years to spend researching a large collection. Working closely with objects allows me to develop knowledge through distant readings, where cataloguing can suggest the relative ubiquity of different styles and retailers, and close analysis, examining component parts, materials, and manufacturing techniques. Material analysis offers the opportunity to answer questions that other approaches cannot. Because instrument manufacture followed everyday repeatable practices, they may not be well described by documentary evidence. Simple facts, like the manufacturing tasks performed and the materials used, can be illuminated through material analysis. Similarly, material analysis can reveal the various ways that it is possible to use an instrument, suggesting possible exhibition practices and countering the ephemerality of lantern performance and its inherent historical loss. In both cases, we can use objects to create new knowledge on the techniques needed to successfully manufacture and exhibit magic lanterns and link this information with further scholarship on how different paradigms operated.

Much of this provides silent grounding for my research. I have seen more objects than I can describe here. The collections form a foundation of knowledge on common and exceptional lanterns, slide subjects, mechanical effects, illuminants, etc.[8] I am lucky to have had the chance to return to collections repeatedly, revising my conclusions or rethinking them in light of more recent discoveries. Collectors have exploited this kind of slow learning over decades.

But material research should not replace other methods. A holistic media history should integrate different approaches into a more developed framework. Material history can uncover manufacturing practices and networks. Sociological history can reveal exhibition practices and audiences. Content analysis can explore the stories and styles of lantern performances. These approaches all require different forms of evidence to speak about different aspects of history.

I will keep close to the evidence and look to reveal key moments from this formative era of media history. Paradigmatic studies will be used to suggest indicative practices and help us to understand the growing trade in media novelties. I will show that Carpenter and others were plugged in to ongoing economic, discursive, and industrial transformations, and that these drove the emergence of the lantern trade. I will go on to show how lantern production was driven by changes in the broader

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[8] In the same fashion, my research owes a silent debt to the *Encyclopaedia of the Magic Lantern,* Gloria Clifton's *Directory of British Scientific Instrument Makers* (1995), and the Hechts' *Pre-Cinema History.* These texts are too fundamental to my knowledge of the lantern to do justice with citations.

industrial landscape. Increased efficiency in workshop manufacture across the metal and toy trades enabled greater production and a growing consumer base provided an expanded market for novelty instruments.

I will chart a circular course around the practices and instruments of the era, revealing commonalities between paradigms and studying key moments from different angles. At times, we will leap between paradigms. These stories will fit together in a patchwork of supporting ideas and explanations, accumulating material and documentary fragments to outline a footprint of the emerging lantern trade.

III. Micro-histories

Material analysis can reveal information about the lantern trade and its networks of production, retail, and exhibition. But we also need to expand these discrete moments into larger frameworks that can reveal something more significant about the lantern's development over the decades. Among media historians there tend to be two ways of doing this. Some scholars use localised evidence to build large interpretive frameworks that suggest currents spanning many decades (Kittler 1990 [1985], 1999 [1986]; Crary 1990, 1999), while others tend to isolate moments and address them in their specificity, avoiding large-scale explanatory models (Gaudreault 2011 [2008]; Kember 2009; Zielinski 2008 [2002]). I draw this distinction to suggest similar approaches to arranging evidence, rather than opposed and established methodological schools. Some historians utilise both approaches, staying close to delineated historical contexts and avoiding large interpretive schema, yet still developing histories that span decades (Huhtamo 2012, 2013, Mannoni 2000 [1995]; Rossell 2008).

Here I consider methods for building interpretive models through micro-histories, and suggest how to expand material findings into interpretive frameworks for different modes of lantern practice. My own research observes the changing state of lantern practice at a key moment, but with effects over several decades. I show how lantern retailers experimented with optical media instruments and slowly became conscious of themselves and the wider trade. But I also show how the emergence of the trade is rooted in everyday practices. Big histories can only be revealed through small details.

The micro-historical approach is more common among media historians than large-scale interpretation. Much early cinema scholarship favours micro-history as a way of avoiding teleological perspectives, where nineteenth-century optical media

prefigures elements of classical cinema.[9] Researchers wanted to understand early cinema in relation to its own diverse cultural and institutional practices, including those formations different (or opposed) to later modes of cinema. Noël Burch (1990) revealed the economic and cultural conditions behind the transition to the institutional mode of cinema in the 1910s, demonstrating that there was no typical form that cinema was destined to take, but complex frameworks of cultural and political pressures that served to mould it along many different lines. Tom Gunning's work on the cinema of attractions (2006; Gaudreault and Gunning 2006 [1986]) similarly demonstrated that earlier modes could have different priorities and develop their own stylistic conventions.

There are different uses and traditions of media practice because of the cultural tendencies and economic pressures that shape how technologies are approached and utilised. Gaudreault calls these tendencies cultural paradigms (2011 [2008]). These help to determine how technologies are used, how they are developed, and the discursive frameworks through which they are discussed and thought about. Gaudreault argues that there is evident difference between a magical transformation film and a phantom ride because of the ways that the technical components are situated within cultural and discursive frameworks. Such paradigms are so different that it makes little sense to study them using the same methods. As Joe Kember argues, there is also a powerful institutional framework that situates entertainments within existing traditions (2009). He argues that the diversity of early cinema and lantern exhibition results from the heterogeneous collection of practices bound up in different institutional frames. These institutions are relatively stable clusters of conventions and resources, that are both enabling (in that they make certain practices possible) and constraining (in that they limit practices to institutional requirements). Kember situates early cinema exhibition within the commercial or instructional imperatives central to various institutions, and demonstrates how different exhibition strategies were utilised to connect these imperatives with audience expectations.

These are methods for drawing evidence into isolated historical frames. Kember, Gaudreault, Burch, Gunning, and others reject a technological essentialism in favour of studying paradigms and institutions assembled through clusters of techniques

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[9] Avoidance of teleology is a commonly cited benefit of numerous approaches (Huhtamo 2013: 16-18; Rossell 1998: 2-3; Gaudreault 2008: 17-21, 33-34; Kember 2009: 1-4). This follows a rejection of totalistic theories developed by an older generation of researchers. Such rejections are now voiced so often as to be becoming straw men. Today no serious historian considers their job to be a search for original moments of invention, essential aspects of a medium, or linear explanatory models.

and practices.[10] For Gaudreault, the key characteristic of the early Méliès films was not technology, but a cluster of techniques developed at the Theatre Robert-Houdin over the preceding 8 years. Méliès' cinematic practice was a continuation of his pre-cinematic magician's practice and so it makes sense to study his films through this paradigm (2011: 40-44). To understand an instrument maker, we could set clear contextual boundaries (to designate a local manufacturing paradigm) and attempt to establish the conventions, discourses, or procedures operating within it. This could establish how manufacturing and retail infrastructures were operative; how they made certain modes of practice possible. A manufacturing infrastructure, retail network, or set of performance conventions are, in Kember's words, kinds of institutions that enable a mode of media practice; in Gaudreault's words, they are cultural paradigms with established aims and traditions.

Having defined the paradigms around a moment of transformation, we may look for other evidential fragments that can answer other questions. This is an approach favoured by Zielinski and Huhtamo. Both illuminate historical moments through reference to textual and material fragments, but these are differently embedded into each researcher's work. Zielinski favours a proliferation of discrete moments in time, where the media systems of different practitioners are described, but not connected to others. Zielinski calls this a variantology of media that addresses media apparatuses that exist outside the standard history of technology (2008 [2002]: 7). In contrast, Huhtamo, influenced by cultural studies, expands outwards from material history to reveal a cultural world clustered around media systems. His work is continuous in time but does not follow a strict chronological development, aiming to show how media and exhibition culture change without suggesting any grand explanatory frameworks (2012, 2013). Both Zielinski and Huhtamo are wary of large-scale historical interpretation and this has important effects on their work. Zielinski's research is a procession of unknown or unvalued innovators, while Huhtamo's shows the exhibition cultures and social operations of previously marginalised media, such as the moving panorama (2013) or the peepshow (2012). Their focus is on histories with little existing interpretation and this tends to result in successions of self-contained minor histories that relate to other discrete moments to reveal broader pictures (in Huhtamo's work) or remain absolutely distinct so as to stand for an unrepresentative moment in time (in Zielinski's work).

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[10] These scholars do not reject technical histories as such, but their fragments and moments are not exclusively selected by virtue of their belonging to a given technical medium. As work by Cleveland and Pritchard (2015), Barry Salt (1983), Barnes (1976), Rossell (1998), and Mannoni (2000 [1995]) shows, technological histories of optical media are valuable and surprisingly rare.

Both show convergent and divergent approaches across time, but with Huhtamo prioritising thematic continuity and Zielinski prioritising ruptures. Zielinski allows alternative media practices that stand outside of timelines that would struggle to include them. He proposes an 'anarchaeology' that is without restraint or discipline (2008 [2002]: 27-28) and sets difference as a guiding structural principle. He conceives of history as an obscure plane of unseen events that he calls deep time—a virtual history, actualised in diverse fragments that light up a world and a media network operating around it. But these are assemblages of fragments that could always have been interpreted differently, to show other processes or structures. The question remains as to why Zielinski's histories (or indeed Huhtamo's, Gaudreault's, or Kember's) take the form they do. The paradigmatic approach requires historians to consciously establish research questions that determine how histories are assembled. I will borrow aspects of Zielinski's approach, but look to scramble each historical moment and make it otherwise, so as to reveal new properties. Can I reorient Carpenter's Phantasmagoria Lantern in a variant paradigm, surround it with new evidential fragments, different practices, and priorities, to tell this story differently?

IV. Big histories and variable paradigms

The process of writing large-scale histories is often set in contrast to the paradigmatic approaches. In media history, they may trace some essential quality that determines the development of a medium (Bazin 2005 [1958]; Ceram 1965) or show how technologies negotiate changes over long periods of time (Kittler 1990 [1985], 1999 [1986], 2010 [1999]; Crary 1992, 1999). The former tendency has been functionally rejected by almost everyone, but the latter retains some explanatory power. The issue that arises is how convincingly long-term interpretive models are embedded in the evidence base of each scholar, and whether some other change or continuity may have been suggested had the evidence been assembled differently. In Kittler's and Crary's work, the reader must make a leap from fragmented evidence to general thesis. The broad explanatory framework exists at a remove from each researcher's main analytical project. Crary asks us to accept a consciously selected set of texts and objects as evidence of a huge transformation in vision (1992). As alternative histories by Zielinski and others suggest, there are always other fragments that might have suggested a different story (Gitelman 2006: 10; Battchen 1991). Moreover, there may be other explanations that do not require an overarching theoretical framework. The Phenakistiscope, for example, is better integrated into an analysis of retail strategies in the 1830s than interpreted through Crary's perceptual transformation (1992: 104-116).

But larger interpretive frameworks that cross many paradigms and cover longer periods of time remain valuable because they allow us to identify and explain more complex changes. The lantern trade's roots stretch back decades and are subtly integrated into many different commercial, technological, and exhibition paradigms. The risk is in formulating explanatory models that are inadequately supported by micro-historical research. I propose that this can be avoided by building out from the paradigmatic approach, so as to cross the divide between large and small histories in increments. My findings are generated by localised and minor evidence, but have, I hope, implications for a century of lantern culture.

The most influential exponent of a global or expansive historical framework is perhaps Fernand Braudel. He developed several important approaches to historical interpretation that are of use to the media historian. Braudel's most significant methodological contribution is his conception of different historical processes having their own temporalities. He shows that time moves at different speeds at the level of events, institutions, structures, systems, and environments (1980 [1958]: 27-34). His project on the Mediterranean (1975 [1966]) begins with a geo-historical account of different regions. Braudel shows that geological time moves at a slowness beyond the range of human experience, but that it was active in shaping the collective lives of different peoples. The histories of events, institutions, and systems move faster (at different rates, in stuttered advances), but each have their own logic and scales that are not always visible at the human level. For Braudel, history does not follow any single current: it is made up of different threads and scales that intersect. His work shows that these isolated threads must be approached with distinct and relevant interpretive models and then layered over one another to produce more complex histories of differing temporalities (1980 [1958]: 44-47). So when we say that a lantern trade emerged over the decades after 1820, this does not preclude the existence of other emerging technologies (like limelight or lithography), or concurrent changes within retail or exhibition landscapes. This emergence is composed from smaller shifts and emerging practices, all producing variously rapid or slow-moving aftereffects.

Media history is receptive to Braudel's variable temporalities because it is already concerned with everyday rhythms and social practices. So much of early cinema research focusses on reproducible media and repeatable activities, with historians using individual case studies to reveal general tendencies of audiences and exhibitors. Outside studies of key inventions, early media scholarship is mostly unconcerned with the history of great events, which Braudel sets against his multi-stranded histories (1980 [1958]: 27-28). The numerous micro-histories of lantern scholarship are not (or not only) concerned with the history of events, which Braudel

situates at the smallest scale of his methodology, but with describing a moment and the activities of people within it. Lantern history requires attention to the everyday practices of audiences, users, exhibitors, and manufacturers, and these function at different speeds and rhythms. Exhibition can be singular or repeatable, following the same format night after night or moving around and embedding in different contexts. There can be long periods of continuity where exhibition formats change very little, with periods of radical change, where an innovation drives an industry to adopt new practices. These rhythms show time moving unevenly as the temporal cycles of exhibition, retail, and manufacture intersect with the rhythms of infrastructures, economies, and geological materials.

One way of revealing obscure connections, as I have suggested, is to uncover a structural history beneath the history of events. Braudel asks what systemic, institutional, intellectual, or economic structures are in place to make an event possible (1980 [1958]: 31). We may ask how a lantern practitioner exploits existing structural conditions, and how these conditions make certain practices possible. My research follows these questions, utilising existing research on the operation of commercial, manufacturing, and exhibition networks, uncovering new cases of media practice, and gradually building outwards towards an extensive history of the emerging lantern trade.

Braudel's structural perspective speaks to existing media histories by Kittler and Zielinski, while helping to resolve important questions raised by their work. Kittler already works in non-human histories, responding to Michel Foucault's archaeology project by emphasising the role of machines in human communication. For Kittler, a discursive fragment is not only a record of human communication, it is a record of humans speaking through machines. Machines control what can be said, done, or thought in a given situation, so by studying their evolution we can understand the discursive, functional, and conceptual conditions of society. In *Optical Media* Kittler's approach to Kircher's writings on the magic lantern is to place him in a wider Jesuit communication network (2010 [1999]: 70-88). This is already a kind of structural history, but we could go further and interrogate the relationship between the Jesuits and the instrument trade, or show where they were active, or how media systems contributed to their work. We could critique the politics of survival inherent to historical datasets. Kittler never considered how the surviving statements of technical systems were implicated in structures of privilege; how the collection and preservation of certain modes of evidence were bound up with how we value different ways of living.

Braudel had already noted the machine-like conditions of communication networks and sea transport, but also addressed the effects of non-machine structures

like economies and bureaucracies. These too are forms of political technology. Braudel opens Kittler's machine history to other systems of ideas, migrations, and environmental changes. Similarly, his historical vision intersects with Zielinski's articulation of deep time. Zielinski addresses different models of time and suggests that they operate in different historical spheres (2008 [2002]: 28-32), but the analytical content of his variantology project neglects to explore the variability of time, setting individual cases in their historical irreducibility. As he suggests, these historical windows are 'attractive foci, where possible directions for development were tried out and paradigm shifts took place' (2008 [2002]: 31). But deep time does not progress in paradigm shifts. As Braudel's geo-histories show, it develops by slow, grinding movements. These may be transformational, but they do not operate at the level of Zielinski's heroic inventors. Historical difference, in the methods advanced by Zielinski, Kittler, and others, must account for working people and the political implications of evidential survival.

More recently, Jussi Parikka has suggested methods for uncovering structural, ecological, and material systems. He proposes an analysis of the materials of media, sketching the ecological impact of their manufacture and extraction (2015). Although it concerns contemporary media and its mineral components, Parikka's work nonetheless has useful implications for media historians that point towards historical explorations of the material substrata of a given paradigm (Roberts 2016c). Similarly, Cubitt shows how clusters of techniques and practices must be in place for media to operate. He shows how Rembrandt's artistic practice implied a field of knowledge and techniques concerning particular pigments and inks, with their own developmental histories and technical requirements (2014: 27-35). Combining Parikka's material analysis with Cubitt's practical networks and Braudel's environmental history can open lantern history towards new structural and technical perspectives that operate beneath the level of events. Even where lantern practitioners are not connected by causality or influence, they operated within similar structural conditions—determined by nineteenth-century capital, economics, technology, or infrastructure. Every moment in the history of the magic lantern is the visible tip of an obscure substrata that sustains and enables a form of lantern practice. Each paradigm is a tangled arrangement of networks, materials, techniques, and other forces that need to be described and understood.

I will arrange a scattered history of lantern practice, approaching the surviving evidence from different standpoints to cover gaps and neglected questions. This preserves the focus of Zielinski's approach, allowing moments in time to stand for themselves, and accepting the challenges that they pose to larger interpretations. Moving between discrete micro-histories, revealing new practitioners and technologies,

re-reading them through different practical frameworks, I will produce a larger history of the emergence of a trade.

In this way I will avoid the large-scale comparative histories where two or more moments are used to suggest differences and continuities at a remove of many decades. By setting down several connected minor histories we can avoid making individual cases bear too much interpretive responsibility. Even accepted moments of transition were only one of many events in their own time. There are always counter-examples that can challenge or subvert historical interpretation, and these should be lined up alongside our micro-histories to do justice to the difference inherent to any history. It seems that the Phantasmagoria Lantern heralded a new era of domestic lantern use—but did it really trigger a media revolution, or merely follow behind a collapsing wave of greater magnitude? Most lantern scholars credit Carpenter with key technical and business innovations, but there are earlier examples of many of his accepted contributions. By shifting our perspective around him, to retail and manufacturing contexts, we may better understand his relationship to the nascent trade structures.

V. The Magic Lantern and its World

Gaudreault says that early cinema practice is situated within discrete cultural paradigms. Thomas Kuhn says that useful and enabling clusters of scientific knowledge form discursive or practical paradigms (1962). Kember says that exhibition culture is wrapped up in the enabling and constraining practices of different institutions. Brooks McNamara says that different theatrical cultures are organised into distinct scenes with their own traditions and priorities (1974). Zielinski studies technical systems as variant applications of knowledge. Gilles Deleuze, philosopher and concept-forger, says that knowledge is framed in concentric circles of diagrams, abstract machines, assemblages, … (1988 [1986], 2006 [1988]; Deleuze and Guattari 2004 [1976]).

It does not really matter what we call this elusive, enveloping idea. All of these framing concepts are only ways of organising information into intelligible clusters. We use these concepts to reframe the messy lived experience of history into usable explanatory frameworks. We build little narratives and descriptive pictures out of the evidential fragments of the past. These are complete in themselves (as Zielinski saw), in that they contain all the necessary terms of their own explanation. But they also stumble towards wider networks of historical trajectories and further paradigms (as Braudel understood). There is a loss inherent to any paradigm and an abyssal darkness at its edge. Every fragment illuminates, with absolute certainty, some minor

occurrence, or thought, or person, or practice; but also suggests an unknown series of connections that once spread out around it. This is the deep time of history.

Leibniz had a term for these enveloping frames (these paradigms, institutions, scenes, diagrams, assemblages, etc.). He called them monads (2005 [1714]). These are particular organisations of the world, constituted by discourses, systems of ideas, and material structures. A monad, formed by discrete clusters of evidence, presents a particular viewpoint from which to understand a historical moment, replete with tacit assumptions, prejudices, and possibilities. Monads, or paradigms, are single orderings of an entire world. They are newly-opened windows onto a deeper obscure time that stretches toward infinity.

> Leibniz's most famous proposition is that every soul or subject (monad) is completely closed, windowless and doorless, and contains the whole world in its darkest depths, while also illuminating some little portion of that world, each monad, a different portion. So the world is enfolded in each soul, but differently, because each illuminates only one little aspect of the overall folding. (Deleuze 1995: 157)

A monad provides a lens through which to observe a long-ended life. It is structured by the concepts and prejudices that were used to build it, which may be challenged or contradicted by others. We build histories that enable us to view the unseen contours of a dead world.

This is why histories of technology must be messy. I will present paradigms and practices and competing perspectives in succession. Every paradigm conjures a life and a world that is lost, and which must be re-made and brought into dialogue with others. They must be built and interpreted, and then scrambled and refolded with other questions in mind.

This is what Benjamin had confronted in the *Passagenwerk,* and, in another way, what Braudel had attempted with his multi-layered *Civilisation and Capitalism* project. History takes place everywhere at once and in so many variants that we can never write a work that is equal to it. But we can frame our studies so as to stare down its complexities and inherent losses. Benjamin identified thirty-six intersecting histories and hundreds of individual souls that spoke of them. But life cannot be neatly collected into thirty-six paper bundles and hidden under a floorboard of the Bibliothèque Nationale. E.P. Thompson once discovered the equally cacophonous voices in the early overtures of the working class movements (1968). In another way, Herman Melville once raised a polyphony of harpooners and naturalists that could speak of a whaler's life and that was equal to the encyclopaedic spirit of his age (1976 [1851]).

Later, in still another fashion, Jorge Luis Borges compressed the spiralling series of monads and their projected histories into a brilliant logic puzzle:

> He believed in an infinite series of times, in a dizzily growing, ever spreading network of diverging, converging and parallel times. This web of time—the strands of which approach one another, bifurcate, intersect or ignore each other through the centuries—embraces *every* possibility. (1965 [1956]: 91)

The lantern was a machine for making the world visible to itself. Its own history can now only be assembled in fragments of time from the detritus of its many lives. Most lantern worlds are now irretrievably lost. Some can still be found, and unfolded, and followed towards other worlds. Ephemeral media histories become, in Borges' words, 'an enormous guessing game, or parable, in which the subject is time' (1965 [1956]: 91).

Chapter 1.

Philip Carpenter and the Improved Phantasmagoria Lantern

I. The Expansion of Lantern Retail, 1810–1840

The Improved Phantasmagoria Lantern arrived at the beginning of the 1820s, heralding a new era of domestic media. The industrial revolution had happened (Wrigley 1988, 2010; Landes 1972; Hudson 1992), and new commercial revolutions after it (Alexander 1975; McKendrick, Brewer and Plumb 1982). Economic, technical, and cultural changes had generated new possibilities for popular retail. I will show the impact of a new consumer lantern on media culture and present a case for understanding media transformation in the context of changing discursive, retail, and manufacturing structures. This new lantern helped to propel the instrument towards ubiquity in the popular imagination. It made the magic lantern an everyday commercial instrument, encouraged further retailers and manufacturers to take it up, and helped establish the conditions for the emergence of a specialist lantern trade. This new lantern was a crystallisation of several new approaches to retail appearing at the beginning of the century. The Phantasmagoria Lantern reframed the instrument as a desirable consumer package and situated itself in a broader context of moral education and public spectacle. It was successful because these innovations made it simple to purchase and operate and because they pulled the lantern into a broader discourse on science and wonderment.

The magic lantern trade was a network of manufacturers, retailers, and performers, established to support the commercial exploitation of the lantern and similar optical media. The networks of production and distribution subsumed under the trade enabled the media culture of the latter half of the nineteenth century. Its basic conditions emerged over the decades from 1810 to 1840 and it began to flourish as a specialised trade around midcentury. It developed out of a reinterpretation of the magic lantern as a consumer object. The success of various consumer media technologies demonstrated the profitability of lantern retail and established the first technologies of

vision in the middle-class home and the public consciousness. By 1860 the lantern was everywhere.

At the beginning of the century, magic lanterns were manufactured by scientific instrument makers, as they had always been (Rossell 2003). They were produced using artisanal practices as one optical device among other scientific or professional instruments. But something happened in the instrument trade that drove an expansion in the market for optical media devices. Opticians were already selling increasing numbers of instruments for personal and domestic use (Morrison-Low 2007: 271-273). There was not yet a specialised lantern trade, as production tended to remain in the hands of opticians and instrument makers, but there was the beginnings of a trade in non-scientific optical technologies that revealed a glimmer of the later market for consumer media and optical toys (Roberts 2017). Between 1817 and 1836 the Kaleidoscope, Improved Phantasmagoria Lantern, Thaumatrope, Phenakistiscope, and Stereoscope all appeared on the market. Their popularity helped forge a market for amateur consumption of optics. These were luxury or novelty consumer technologies intended for non-scientists. Many still appealed to scientific or educational credibility, but they also peddled a form of spectacle that channelled earlier popular entertainments.

We see a broad outline of the era by tracing Philip Carpenter's career. He first appears in the trade records as a practising optician in 1808, working on Inge Street in Birmingham with his uncle William Carpenter (Clifton 1995: 49).[11] He moved to Bath Row in 1813 (LB MS 3375/407007), where he practised as a manufacturing optician, before opening a shop on New Street around 1817. That year, he collaborated with David Brewster to produce the Kaleidoscope, and in 1821 he released the Improved Phantasmagoria Lantern, a consumer magic lantern complete with slides and accompanying readings. Both devices targeted a non-specialist middle-class market and both were extremely successful. In 1826 he opened another shop at 24 Regent Street in Westminster (R.L. Carpenter 1878: 4), where he established an exhibition of microscopic views called the Microcosm (P. Carpenter 1827; ScM 1934-124; Roberts 2017). This proved a popular addition to the attractions around Regent Street. Carpenter died in 1833, leaving a £4000 estate (NA IR 26/1316; NA PROB

[11] It is not clear how Philip trained as an optician. He states in the *Companion to the Microcosm* that he had worked as a manufacturing optician in Birmingham for thirty years (1827: 26). This means he would have started work around 1796. He was probably trained by his uncle William Carpenter, who is listed under the same address in 1808 (Clifton 1995: 49), and who dies the same year, with no children (R.L. Carpenter 1878: 53). This suggests that Philip succeeded to the Inge Street business.

11/1815/261). This made him reasonably wealthy for the time and shows that his ventures in consumer retail were successful.

After his death, Carpenter's business was taken up by his sister Mary and foreman William Westley, becoming Carpenter & Westley in 1836 (R.L. Carpenter 1878: 7-8; *Aris's Birmingham Gazette,* 19 Aug 1836; ScM 1948-397/10). They continued to manufacture and sell consumer media, retailing increasing numbers of slides and lanterns and establishing the firm as one of the key businesses in the emerging lantern trade. Mary Carpenter died in 1877 (*The Standard,* 3 Nov 1877), followed by Westley in 1887.

Westley's obituary shows that the business was now worth £66,442 (*Morning Post,* 8 Apr 1887). This is a quite staggering sum, worth something akin to ten million pounds in today's currency.[12] It shows not only that Carpenter & Westley were a leading retailer, but also that their market—principally glasses and consumer media—was able to sustain their success. That this business could grow from a small Birmingham manufactory in 1808 to a major retailer on one of the most prestigious streets in London by 1887 shows that the avenues of possibility for an instrument maker had expanded substantially. This happened because scientific instrument manufacturers had found new markets in the nineteenth century, exploiting middle-class spending power and benefitting from growing prosperity over the century (R. Brown 1991: 293-295; Tames 1972: 15-26; Crouzet 1982: 31-43).

The expanding consumer economy of the eighteenth and nineteenth centuries (R. Brown 1991: 219-221) formed the conditions for the emergence of the lantern industry. This coalesced in the 1820s in a growing network of shops that shifted the conditions of consumption towards sedentary retailers (Alexander 1970: 89-95; Winstanley 1983: 12-16). Over the few decades from 1810 to 1840, instrument makers experimented with new retail practices and began to capture a large market for consumer technologies. By looking at the different ways that these technologies were manufactured, advertised, sold, and used we can begin to understand the new practices and changing structural conditions that enabled the emergence of a lantern trade. From the 1830s, the major use of the instrument shifted from a specialised entertainer's apparatus or expensive rarity to an everyday domestic toy; it became

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[12] Calculated using the National Archives' currency converter tool (http://www.nationalarchives.gov.uk/currency). The converter shows that £66,442 in 1890 was worth nearly ten million pounds in 2005. By contrast, Carpenter's estate was worth around £200,000 in modern money. This conversion tool calculates approximate value by factoring in inflation over time. Actual equivalency is very difficult to calculate, as many further conditions complicate how we understand currency value, real wages, and standards of living (R. Brown 1991: 314-321). I offer this as a general guide only.

something that might be owned by any (quite rich) curious person, and no longer confined to the margins of society. Scientific instruments were now sold as everyday consumer objects.

I will suggest how a small revolution occurred in the availability and visibility of optical media in the 1810s and 1820s. My exploration of this important phase of media production will be embedded in the case of the Improved Phantasmagoria Lantern, the first popular consumer lantern. Our key emblematic figure is its maker Philip Carpenter, a highly visible practitioner throughout the era. Carpenter very successfully exploited the new markets and production possibilities, and was one of the first to establish a successful modern trade in lanterns and other optical media devices (Hecht 1993: 77). I show how Carpenter exemplifies the new techniques that drove this period of expansion in lantern manufacture and retail. His case reveals practices and suggest broader trajectories among lantern and media manufacturers. In the next chapter, I use surviving objects and primary texts to suggest an indicative set of practices for exhibiting the lantern in a domestic setting; a form of exhibition that is almost never recorded in the historical record. We will see how the new consumer lanterns arrived and what new modes of domestic exhibition they enabled.

Using new findings, I want to challenge the accepted myth of Carpenter as a technical innovator. Carpenter is a key media practitioner, but he is not driving any structural changes by himself. I want to rethink Carpenter as only one example of an instrument maker shifting into the entertainment media market. This overturns existing critical approaches that view him as a significant innovator and originator of new technical practices. Carpenter is a highly visible example of lantern practice, but he is not a unique inventor. Reappraising his role in this era of media history provides a better understanding of how practitioners navigated the expanding lantern market. Using new information about earlier instrument makers and retailers, I will go on to show that his career does not even provide the earliest example of many practices that he is credited with inventing. Carpenter was following earlier examples of lantern production and reusing practices first developed by a host of manufacturers.

Throughout, I will remain attentive to the challenge that the magic lantern poses to media history. Its enduring ephemerality and the fragmented nature of its surviving historical record has produced many lacunae that we cannot hope to fill. I use the surviving material evidence against accepted histories of media, to construct an explanatory framework in the manner of a structural history. Carpenter alone cannot provide a complete explanation for the emerging lantern trade, but the incomplete evidence of his contemporaries cannot hope to provide a compelling counter-case.

Over several chapters, using the Carpenter sources and the fragmented information on other manufacturers and retailers, I will construct an indicative lantern practitioner; that is, a framework to highlight common approaches and concepts over the decades. In the same manner, I will suggest a model for domestic lantern practice, which exists as an absence at the centre of this expansion in lantern retail. Overall, I hope to use the many scattered fragments of early nineteenth century lantern practice to build a usable explanatory model to show how lantern practitioners were exploiting changing economic conditions. A child or amateur lanternist or popular lecturer can focus all of the intersecting networks of the lantern trade in a moment of use; actualising the potentials of their changing media paradigms in a condensed beam of light, and a tiger emerging from the darkness.

II. The Instrument Makers

Before the organised exploitation of media, before the formal magic lantern trade, the photography business, and the institutionalisation of cinema, the optical toys intended for commercial retail were manufactured by artisans specialising in various non-media fields. Magic lanterns were typically made by scientific instrument makers; Anamorphoses, Thaumatropes, and Phenakistiscopes were made by printers; mechanical music boxes were made by watchmakers. For much of the early history of media, these devices were manufactured by professionals working in cognate fields. They were not the most significant aspect of each artisan's professional practice.

This has been poorly understood by lantern scholars, whose interest in the device can blind them to the relative unimportance of the magic lantern in the professional lives of most of the early manufacturers. John Cuff was a spectacle and microscope maker (O. Brown 1985: 26). Benjamin Martin was a natural philosopher, writer, and microscope and telescope maker (O. Brown 1985: 32-33). Both are known as significant lantern manufacturers of the eighteenth century (Rossell 2008: 72, 76). Even Carpenter, whose modern practices were a major contributing factor to the expansion of the lantern trade, was primarily an instrument-making optician. An 1833 catalogue shows how his stock was dominated by microscopes, telescopes, and other optical instruments, with his lanterns occupying relatively limited space (P. Carpenter 1834: 11-12). Given the high volume of spectacles produced in Birmingham, and Carpenter's reputation as a skilled optician, it is likely that much of his early business was in simple spectacles produced in quantity (Timmins 1967c [1866]: 533-535). At the turn of the nineteenth century, and for much of the century before, lanterns were a relatively unimportant part of an instrument makers' repertoire.

Although the instrument trade has been neglected by most media scholars, some have understood its importance to the early history of media. Rossell has best integrated the instrument trade literature into his studies of the lantern in the eighteenth century (2008: 76-91, 2002, 2003, 2005). Laurent Mannoni (2000 [1995]: 46-47, 55-62) and Wagenaar, Wagenaar-Fischer and Duller (2014b: 27-37) identify some instrument makers as contributors to early lantern manufacturing practice (principally Johann Griendel, Jacabus Lommers, the Reeves, and the Musschenbroeks), but they do not have Rossell's awareness of the instrument makers' own aims and practices. In each case, the lantern was transformed through its integration into existing paradigms. In order to understand the various modes of practice that determined the lantern's production and dissemination we need to make use of the extensive literature on the scientific instrument trade, which details the changing manufacturing practices, commercial practices, aims, and structural contexts of instrument makers going back to the sixteenth century.

The instrument trade literature has faced similar problems to lantern scholarship. It was once led by museum curators, antique collectors, and enthusiasts and only relatively recently have greater efforts been made to extrapolate the numerous minutely detailed but descriptive pieces of research into a more reflective and critical history (Millburn 1986; Morrison-Low 2007: 6-12). However, because of common aims and contexts, the instrument trade literature has been better integrated into broader economic (Daumas 1972: 90-106; Porter 1985; Baker 2009) and commercial history (Baker 2016, 2017; Bennet 2002) than has media history scholarship. This interdisciplinary approach is expressed most strongly by Morrison-Low, who shows how the instrument trade was impacted by various manufacturing and industrial transformations (2007). Morrison-Low addresses the economic life of the trade at the beginning of the nineteenth century, providing information on the everyday practices of instrument makers. While lanterns were a relatively minor part of most instrument makers' repertoire, descriptions of general manufacturing practice provide important indications of how lanterns were made and what markets they were sold to.

The broader development of the instrument trade during the industrial revolution, outlined by Morrison-Low, can suggest explanations for the changing lantern market over the 1820s and 1830s. In the latter half of the eighteenth century, precision and commercial instrument making were diverging into separate markets, respectively catering for experimental scientists and middle-class amateurs. The literature shows how the instrument trade was plugged into the developing currents of the industrial and commercial revolutions. The instrument makers continued to use many of the same artisanal, small-workshop approaches as were typical in the seventeenth and

eighteenth centuries, but these persisting practices were confronted with new manufacturing and commercial infrastructures that provided access to more efficient sources of materials, labour, and customers. One of the strengths of Morrison-Low's work is in showing how manufacturers and workshops were differently connected with wider industrial networks and markets.

Over the decades at the beginning of the nineteenth century (relatively) cheaply made, off-the-shelf instruments intended for the amateur and consumer markets became increasingly important to instrument retailers (McConnell 1994). This meant that the discursive framework of scientific instruments was changing. What were ostensibly investigative instruments became objects of curiosity for the drawing room. This produced waves of Improved Compound and Most Improved Compound Microscopes, reinterpreted as a consumer object and packaged with interesting microscopic slides (Porter 1985; O. Brown 1986a). The commercial instrument trade attempted to recapture and exploit an older, non-specialist age of science. This was the context in which the magic lantern—by the late eighteenth century now plummeting in respectability and scientific credibility (Rossell 2008: 71-73)—was reintroduced into the core catalogues of instrument retailers. In a context where scientific instruments were valued as curiosities, the lantern was an easily marketable commodity.

The instrument trade literature explains how manufacturing and retail practice (for both the lantern and other instruments) was conducted and changed over the decades after 1800. I will show the many continuities and disjunctures with older paradigms and discuss how these laid the groundwork for a century of transformations in media practice. Continuity of certain aspects of scientific and media instrumentation is a principal finding in scholarship on the continued exploitation of discourses on natural magic, notions of wonder, and novelty. Research by Hankins and Silverman (1995) and Stafford and Terpak (2001) explores the intersecting cultural histories of technology and natural magic, but does not fully consider the importance of consumer retail or reveal the important infrastructures, economies, and material networks that underpin the circulation of scientific and media instruments.

Underpinning the changing instrument market is further literature on the industrial and commercial revolutions, which reveals expanding industrial infrastructures and consumer markets. Many of the core industrial transformations of the era (such as emerging factory production and the exploitation of new industrial technologies) did not have a notable impact on the instrument trade or early media production, as these remained reliant on small-workshop production. Yet while instrument manufacture had its own established practices, it also intersected with those

of other manufacturing paradigms. There is extensive literature on common manufacturing practices in the workshop economies (Berg 1993, 1994: 255-279; Timmins 1967a [1866]). As I will show, the workshop economies of Birmingham and Sheffield, which specialised in small-object manufacture (the former producing buckles, buttons, gun parts, and fancy goods, the latter cutlery and steel wares), intersected with the instrument trade. Instrument makers relied on many of the same materials (tin, brass, iron, steel, glass) as the larger gun, cutlery, and toy trades. This required practitioners to work within the same material networks and led to metal workshop practices being adopted in the instrument trade. The numerous common production methods and conditions may suggest compelling explanations for the changes in lantern production. The lantern trade was changing because production was changing in every sector of the economy (but, as Daunton shows, it was changing unevenly, 1995: 131-145). As I will demonstrate, the wider networks of labour are one key driver of the emerging lantern trade.

All forms of workshop production (of lanterns, instruments, toys, and luxury goods) were intersected by a commercial revolution that transformed retail at the end of the eighteenth century and gathered pace with the increases in production capability at the beginning of the nineteenth century (McKendrick, Brewer and Plumb 1982; Berg 1991; Berg and Eger 2003). As Dorothy Davis shows, it was some time before the impact of mass production was felt in the retail sector (1966: 252). This was particularly the case in those trades that could still efficiently produce reasonable outputs using the old workshop networks. The transformation in retail did not concern a shift towards high-volume consumerism in the modern sense, but it was able to exploit an affluent middle-class market through the production of increasing numbers of luxury objects. The techniques used to package, display, and advertise these goods were novel and helped to establish new markets for scientific and media instruments. This literature has much that applies to the retail practices of lantern sellers. David Alexander provides a valuable description of common retail practices in different sectors of the economy, revealing the work organisation of different trades and their intersection with consumer markets. This offers a useful extension to Morrison-Low's work, which is strongest on the manufacturing networks connected to instrument workshops, suggesting how the broader development of the market for luxury goods helped drive the changes in instrument retail.

These intersecting histories provide a complex picture of manufacturing and retail practices at the beginning of the century. They show how a convergence of historical trajectories offers differing explanations for particular moments in the history of media. These histories can produce shockwaves that carry over longer periods,

producing many related and divergent transformations at different points in time. I will insert the lantern, itself a relatively unimportant piece of a larger cluster of instruments and activities, into these overlapping histories to show how it was connected to, and driven by, different trajectories in the commercial and workshop economies. Over time, this minor optical instrument grew in importance as practitioners developed approaches of their own that were more suitable to the lantern, its users, and audiences.

The lantern trade was the first organised exploitation of media technology, but it did not appear spontaneously of its own accord. Every aspect of lantern practice, the manufacturing networks, retail strategies, and exhibition tendencies were produced by the convergence of historical trajectories. There are many fragments of evidence, objects, sources, and large, well-established bodies of cognate literature that outline a history of lantern practice in nineteenth-century England.

III. A Consumer Lantern

At the beginning of the century, Birmingham was a city of manufacture and trade (Hopkins 1989). The buildings were heavy with small workshops. Trade networks tangled through the city, pulling together wealthy businessmen and shoeless labourers. There was an infinity of trades. Gun makers clustered around St. Mary's, forging barrels and locks and fitting together muskets. Some were traded for slaves on the west coast of Africa. Jewellers seized a nearby quarter and spat out gaudy gilt chains for the vanity market. Buttons, buckles, boxes, pens, nails, tools, Papier-mâché trays, and various shiny things were all connected to a vast infrastructure of metalworkers. The city was organised into a network of independent small practitioners who completed piecework for other businesses. Workers made parts or small objects in grubby little backroom workshops. They sold these to other businesses, who sold them at market, or distributed them elsewhere, or sold them in luxury shops. Many businesses started out manufacturing goods for others, but later set up their own retail operations as money poured into the city.

In 1816 Philip Carpenter was still a manufacturer. He had built his own workshop on Bath Row, where he lived and worked, producing scientific instruments for others. In 1817 he attained a contract to make David Brewster's Kaleidoscope. This, the first optical toy, was spectacularly successful. Carpenter acquired a small single-story shop at 111 New Street that same year, where he sold instruments to Birmingham's middle classes. The majority of his customers would not have been practising scientists, so his goods had to capture the excitement of a curious non-specialist.

The most accurate date we have for the first appearance of the Improved Phantasmagoria Lantern is Carpenter's own claim that it was released around 1821. In *Elements of Zoology,* his 1823 treatise on the animal kingdom, he states (in an advertisement at the beginning of the book):

> ABOUT two years ago I brought out a new magic lantern, which I had invented sometime before; on account of its being particularly well adapted to the exhibition of the Phantasmagoria, it was termed a Phantasmagoria Lantern. At the same time I published a set of Copper-Plate Sliders; and a description of the whole was printed for the use of the Purchasers. (1823a: 4)

This was a tin-bodied lantern with an adjustable double-convex lens arrangement set in a sliding brass lens tube (P. Carpenter 1995 [1823]: 127-128). The accompanying slides, called Copper-Plate Sliders, were printed from engraved copper matrices and then hand painted. Each slide featured several discrete figures, typically animals, portraits, or astronomical diagrams. The lanterns and slides were sold in sets with an Argand lamp (BP 1425; Hecht 1993: 51-52), wooden storage box, and a descriptive reading to interpret the slides (fig. 1). This consumer package was intended to appeal to the expanding middle-class market and designed to be usable by amateur lanternists in domestic performances. The new lens arrangement made the lantern easier to focus, it was simple to manufacture in relatively large numbers, and the slides featured reproducible and standardised images. The descriptive reading encouraged users with little performance experience to speak along with the projected images. The content of the slides and reading appealed to the value of education, while still retaining the draw of pure entertainment. Magic lanterns had been popular for more than a century prior, but Carpenter's new package found an alternative niche for the device that had not yet been fully exploited.[13]

Carpenter's case presents one of the many scattered causes of the emerging lantern trade in England. This moment forms one paradigm that can suggest explanations for the expansion of lantern manufacture over this period. My historical frame will move outwards from Carpenter, towards more general explanations, by exploring the structural networks and recurring approaches that his practice suggests. As Zielinski shows (2008 [2002]), individual moments stand only for themselves, but we

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[13] This is not to say that retailers had never before targeted the domestic novelty market; John Scott in London (Heard 2006: 192-194) and Peter Friedrich Catel in Nürnberg (Scholze 2014) supplied small lanterns to an embryonic toy market at the end of the eighteenth century. The instrument makers of the 1820s and 1830s built a popular market for the lantern that had no earlier precedent in scale. The expansion of the lantern market in this era was a question of magnitude.

can identify common and exceptional approaches and suggest typical modes of practice by piling paradigms on top of one another. This was Braudel's wager in his studies of capitalism and material life (1981 [1979], 1982 [1979], 1984 [1979]). In the 1970s, a time when, in his words, the social sciences were utilising statistical and empirical research methods to 'dehumanise' history (1981 [1979]: 562), Braudel remained working at the level of minor observations and concrete realities described in his source material. He explains:

> Material life, of course, presents itself to us in the anecdotal form of thousands and thousands of assorted facts. […] This is the dust of history, micro-history in the same sense that Georges Gurvitch talks about micro-sociology: little facts, which do, it is true, by infinite repetition, add up to form linked chains. Each of them represents thousands of others that have crossed the silent depths and *endured*. (1981 [1979]: 560)

From here, at the risk of 'descriptive incoherence', he tried 'to classify, order and reduce this disparate material to the bold outlines and simplifications of historical explanation' (1981 [1979]: 559). For Braudel, the cluttered signatures of everyday life are inseparable from larger historical frameworks. They are not irreducible micro-histories distinct from general explanations—they are the raw material from which these explanations must be carved. The Phantasmagoria Lantern did not cause the emergence of a lantern trade. It was a crystallisation of numerous minor trajectories that all intersected to allow for new modes of practice to emerge. The new lanterns rode a wave that eventually broke and dissipated in a new media culture at the close of the century. This moment is an early point of clarity, where future trade structures can be seen in vitro. It is not so simple as to identify Carpenter's clever commercial strategy as a single cause.

An advertisement in *The Liverpool Mercury* summarises the available components of Carpenter's lantern package at point of release. From this advert, we can identify the material and discursive framing of this paradigm. This is the material and descriptive dust of Carpenter's media practice.

CARPENTER'S NEW PHANTASMAGORIA LANTERN,
AND COPPERPLATE SLIDERS.

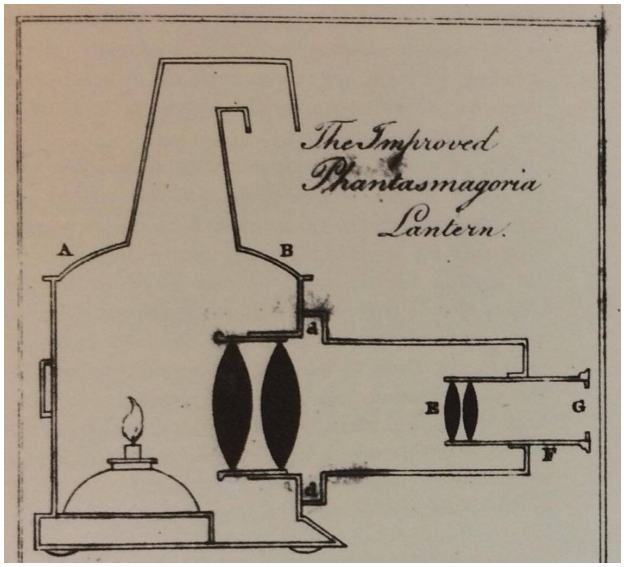
> This Improvement on the MAGIC LANTERN is accompanied by Sliders of a very superior description to those in common use, the outlines being printed from Copper-Plates (engraved for the purpose) and burnt in. By this means, accurate and beautiful representations of Subjects in Natural History, &c. are produced, which could not possibly be obtained in the usual way. The plates already engraved consist of Ancient and Modern Costumes, subjects in Natural History, Portraits of the Kings and Queens of England, Microscopic Objects as they appear in the Solar Microscope, Public Buildings and Views, Astronomical Diagrams, and Humorous Subjects. This apparatus is not only productive of much amusement to the well-informed mind, but may provide a powerful auxiliary in the business of education, in teaching the elements of several branches of useful knowledge. The Lanterns and Sliders are complete in boxes, accompanied by a descriptive pamphlet. The Sliders are also sold without the Lantern, in sets or singly, and at the same price as those of common make. (Bywater 1822: 327; fig. 2)

Early Carpenter lanterns, complete with their boxes, survive in the Museo Nazionale del Cinema, Hessischen Landesmuseum (fig. 1), and the Richard Balzer collection. These lanterns are in two sizes, which may suggest product alterations over time, or different available versions (later Carpenter & Westley advertisements list two size variants, 1843: 577, 1863: 1; Carpenter adverts and catalogues do not). Original slides and pamphlets are present in many collections. The engraved plates, used to print the Copper-Plate Sliders, are now lost.

This advert reveals the conceptual underpinnings of lantern retail, suggesting the importance of education and innovation to Carpenter's marketing. More comfortable as a manufacturer than retailer, Carpenter, as his nephew once said, 'was not well adapted for a shop-keeper: he had no pretensions to tact, and, while he gained the confidence of those who could appreciate his ability, he sometimes lost custom by his bluntness' (R.L. Carpenter 1878: 51). Nevertheless, he had an intuitive understanding of marketing discourse. These ideas frame the Phantasmagoria Lantern as a worthwhile instrument (something that teaches 'useful knowledge') and a desirable novelty. The veracity of such discourses do not always hold up under scrutiny, but they remain significant conditions driving the paradigm. These are the localised implications of the Phantasmagoria Lantern; the ideas and processes through which it was made, sold, and oriented within the world. We can isolate these and plug them into the structural transformations of the century, to show how minor practices connect with the *longue durée* of media history. Carpenter's lantern suggests various

manufacturing innovations and discursive categories that (stretching over decades, repeating, and mutating through other media formations) help to drive the emergence and solidification of a lantern trade. The later success of the trade is not directly caused by the Phantasmagoria Lantern, but the various practices and concepts that underpin this lantern present a major contributing factor. The Phantasmagoria Lantern was built for popular ownership and this helped shift lantern culture into a new sphere.

Figure 1. Philip Carpenter's Improved Phantasmagoria Lantern.



Detail of engraving from 'A Short Account of the Copper-Plate Sliders, and a Description of an Improved Phantasmagoria Lantern,' (P. Carpenter 1995 [1823]).



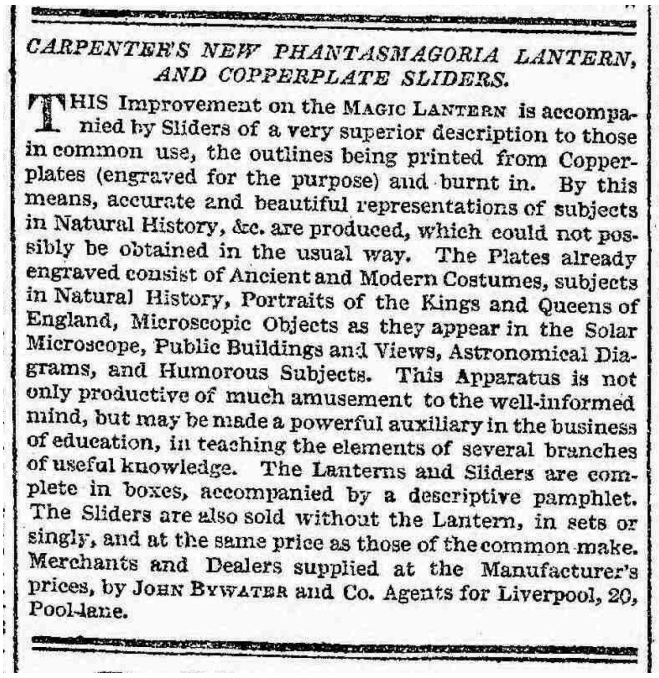
Improved Phantasmagoria Lantern [small], by Philip Carpenter, 1821-1836.
Hessischen Landesmuseum



Improved Phantasmagoria Lantern [large], by Philip Carpenter, 1821-1836.
Museo Nazionale del Cinema,

Carpenter sold Phantasmagoria Lanterns in at least two different sizes; he also lists two sizes of Bulls-Eye Lantern and a cheaper toy 'Dutch Lantern' (P. Carpenter 1834: 11-12)

Figure 2. Advertisement for the Copper-Plate Sliders and examples of slides available in 1822.



CARPENTER'S NEW PHANTASMAGORIA LANTERN, AND COPPERPLATE SLIDERS.

THIS Improvement on the MAGIC LANTERN is accompanied by Sliders of a very superior description to those in common use, the outlines being printed from Copper-plates (engraved for the purpose) and burnt in. By this means, accurate and beautiful representations of subjects in Natural History, &c. are produced, which could not possibly be obtained in the usual way. The Plates already engraved consist of Ancient and Modern Costumes, subjects in Natural History, Portraits of the Kings and Queens of England, Microscopic Objects as they appear in the Solar Microscope, Public Buildings and Views, Astronomical Diagrams, and Humorous Subjects. This Apparatus is not only productive of much amusement to the well-informed mind, but may be made a powerful auxiliary in the business of education, in teaching the elements of several branches of useful knowledge. The Lanterns and Sliders are complete in boxes, accompanied by a descriptive pamphlet. The Sliders are also sold without the Lantern, in sets or singly, and at the same price as those of the common make. Merchants and Dealers supplied at the Manufacturer's prices, by JOHN BYWATER and Co. Agents for Liverpool, 20, Pool-lane.

Carpenter's New Phantasmagoria Lantern, and Copperplate Sliders, 1822.

Liverpool Mercury, 12 April, p. 327.

Advertisement for John Bywater and Co.



Ancient and Modern Costumes, 1821-1836. Museo Nazionale del Cinema, Ref: M03041/009.
A Man of Nootka Sound—a Woman of Norton Sound—a Woman of Otaheitee, dancing—a New Zealand Chief [all after John Webber], by Philip Carpenter.



Subjects in Natural History, 1821-1836. Museo Nazionale del Cinema, Ref: M04311/003.
Mammalia: Six-banded Armadillo—Giraffe—Elephant—Female Elephant and Young, by Philip Carpenter.



Portraits of the Kings and Queens of England, 1821-1836. Phillip Roberts collection.
Edward V, Richard III Henry VII and Henry VIII, by Philip Carpenter.



Public Buildings and Views, 1821-1836. Museo Nazionale del Cinema, Ref: M03053/001.
St. Paul's, the Thames, [a curved building] and the Bay of Naples, by Philip Carpenter.



Astronomical Diagrams, 1837-1860. Museo Nazionale del Cinema, Ref: M03066/003.
Comparative Size of the Planets, Comparative Distance of the Planets, Orbit of a Comet, and The Comet of 1811, by Carpenter & Westley, after Philip Carpenter.



Humorous Subjects, 1837-1860. Museo Nazionale del Cinema, Ref: M03035/002.
Comic figures by Philip Carpenter.

IV. Three Earlier Practitioners

The scientific instrument makers were the first to retail the lantern. They were commercially savvy and had long produced machines for the commercial market. As Rossell shows, at the end of the eighteenth century this increasingly involved selling to non-scientists, as showpeople and wealthy amateurs became the primary market for lantern projection (2008: 69-95). It was natural that these skilled lens-grinders would turn their hand to any instrument that could be assembled using their skill-set, regardless of its field or application.

If we consult the trade cards for earlier lantern manufacturers we see a plethora of instruments and devices. John Cuff of Fleet Street advertised reading glasses, refracting and reflecting telescopes, several different microscopes, barometers, thermometers, and speaking trumpets (ScM 1934-119; fig. 3). John Bennet of Crown Court advertised microscopes, telescopes, rules, globes, sundials, theodolites, and compasses, among a jumble of other instruments (ScM 1951-685/10; fig. 4). Nathaniel Hill of Chancery Lane advertised a similar range of professional and analytical instruments. His trade card announces that he 'makes and sells all sorts of mathematical instruments in silver, ivory and wood, very curious and true graduated for sea or land, with books for their use and the best black-lead pencils' (ScM 1934-102; fig. 5). Many of the items on offer would have been bought in for retail, but each maker would also have maximised their own manufacturing skills to produce all kinds of different instruments. Carpenter too sold all manner of scientific and entertainment devices, as an early trade card shows; he sells spectacles, microscopes, barometers, and camera obscuras alongside his 'New Improved Magic Lanterns' (not yet Phantasmagoria Lanterns; BL MS 4834/844; fig. 6).

Around the turn of the nineteenth century, many instrument makers moved to capture the now rapidly growing market for domestic instruments; selling microscopes, telescopes, looking-glasses, and a range of devices for exhibiting entertaining spectacles. Carpenter was among the most successful of these makers. For him, there was no clear separation between science and entertainment. Earlier makers had also produced instruments that were ostensibly for entertainment purposes. Both the Hill and Bennett trade cards include a magic lantern and camera obscura among their wares, while the Cuff trade card advertises:

> THE CAMERA OBSCURA for exhibiting Prospects in their natural Proportions and Colours, together with the Motions of living Subjects: MAGIC LANTHORNS; Convex and Concave SPECULUMS or

> LOOKING GLASSES, MULTIPLYING GLASSES, […] and many other curiosities. (ScM 1934-119; fig. 3)

Instruments had always been sold as curiosities for novelty consumption. What changed in the nineteenth century was the magnitude of the trade and the common approaches to retailing curiosities. Manufacturers succeeded in building crazes for novelty instruments, retailed as must-have devices and selling at a much faster rate than earlier domestic instruments.

Carpenter's practices were embedded in a wider media landscape. Other practitioners sold Phantasmagoria Lanterns from the 1820s onwards. Most of these bear no maker's mark, and present a range of technical and stylistic differences around the core Phantasmagoria schema (black japanned tin, angled chimney, double-convex lens arrangement). Variations on Carpenter's model included handles, inbuilt lamps, rackwork focusing mechanisms, and cut-away back panels (to insert more complex lighting systems). Other instrument makers selling lanterns or slides over this period included Charles Blunt, Watkins & Hill, Robert Bancks, William & Samuel Jones, Peter and George Dollond, John Jones, Henry Macrae, Edward Wrench, Francis West, Egerton Smith, Andrew Pritchard, and Frederick Cox of the Barbican; there was also John Scott of the Strand, and Jones of Wells Street, who were not instrument makers. Later Phantasmagoria Lanterns were produced by John Benjamin Dancer, Robert Gogerty, Carpenter & Westley, Newton & Co., J.H. Steward, Keyzor & Bendon, Thomas Middleton, and Negretti & Zambra. Doubtless all manner of other minor tradesmen were producing lanterns at the margins of the instrument trade. Carpenter is commonly viewed as an important innovator, but it makes little sense to talk of invention in this context; as the evidence is so fragmented, because priority is so difficult to prove, and because lantern types were so quickly absorbed into a more general manufacturing landscape, with numerous small alterations. As Joel Mokyr argues, larger macro-inventions provide only random shocks; the manufacturing economy was driven by the micro-inventions inherent in many minor improvements and the everyday practices of skilled workers (1990: 291-299, 1994: 43).

Other businesses used analogue approaches to manufacture and retail that were driven by structural conditions and shared practices. Beyond Carpenter, this era of lantern culture is scantily documented, but it is clear that he stood in a crowded landscape of media retailers from a number of indicators that emerge when studying the Carpenter sources. These sources will help me to build a picture of Carpenter's life and practice in detail that is rare for any instrument maker, but they also reveal information about other businesses and practitioners that he was working alongside.

The information is incomplete, but gestures towards the vibrancy of media production, revealing many people using similar practices and producing similar instruments. Carpenter's case can act as a model for many more poorly-documented practitioners.



JOHN CUFF,
Optician, Spectacle, *and* Microscope *Maker*,
At the Sign of the REFLECTING MICROSCOPE and SPECTACLES,
againſt *Serjeant's-Inn* Gate in *Fleet-ſtreet*,

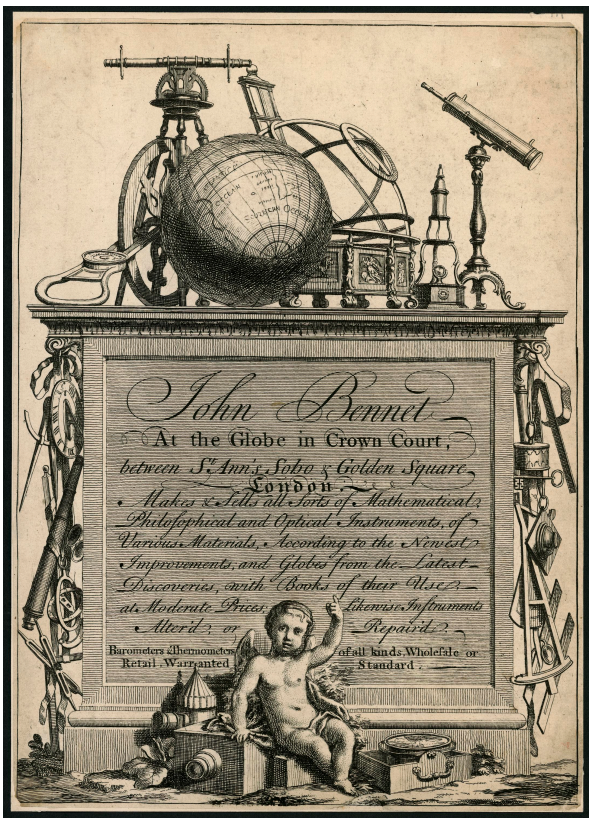
MAKES and Sells all Sorts of the moſt curious Optical Inſtruments, ſuch as SPECTACLES and READING GLASSES, ground on Braſs Tools in the Method approved by the Royal Society, of *Brazil* Pebbles, Rock Chryſtal, or the fineſt Flint Glaſs, and ſet either in Silver, Mother of Pearl, Tortoiſe-ſhell, *&c*, in the moſt convenient Manner for Uſe.

REFRACTING TELESCOPES, proper for celeſtial or terreſtrial Obſervations, either by Land or Sea; and alſo REFLECTING TELESCOPES, as invented by Sir *Iſaac Newton* and Mr *Gregory*.

MICROSCOPES of ſeveral Kinds, both Single and Double, (either for the Study or the Pocket) particularly a new-conſtructed DOUBLE MICROSCOPE, invented by the ſaid *John Cuff*, to remedy the Inconveniencies complained of in all the former Sorts; the SOLAR MICROSCOPE, as improv'd by him with a moſt convenient and manageable Apparatus for viewing Objects, and a Contrivance for drawing the Pictures of them with great Eaſe and Exactneſs, even by thoſe that have never drawn before; the AQUATIC MICROSCOPE, invented alſo by him for the Examination of Water Animals; the OPAKE MICROSCOPE, which by a Light reflected upon Objects that have no Tranſparency, renders them diſtinctly viſible; *Cuipepper's* MICROSCOPE, *Wilſon's* Pocket MICROSCOPE, *&c*.

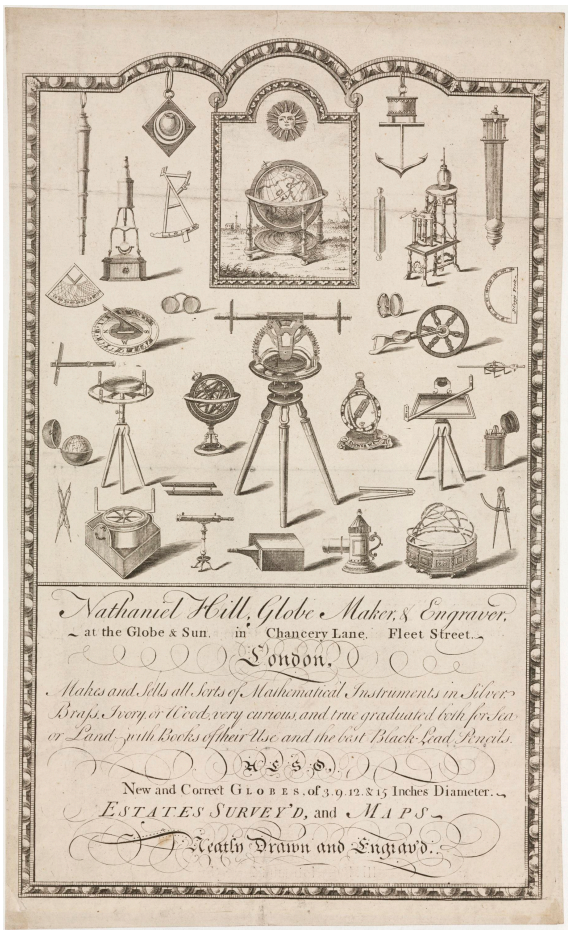
The CAMERA OBSCURA for exhibiting Proſpects in their natural Proportions and Colours, together with the Motions of living Subjects: MAGIC LANTHORNS; Convex and Concave SPECULUMS or LOOKING GLASSES, MULTIPLYING GLASSES, BAROMETERS, THERMOMETERS, OPERA GLASSES, SPECTACLES of true *Venetian* Green Glaſs, SPEAKING TRUMPETS, ſeveral Mathematical Inſtruments, and many other Curioſities, are ſold by the ſaid Operator at reaſonable Prices, either Wholeſale or Retale.

Figure 3.
Trade card for John Cuff, 1731-1770.
Science Museum, Ref: 1934-119.



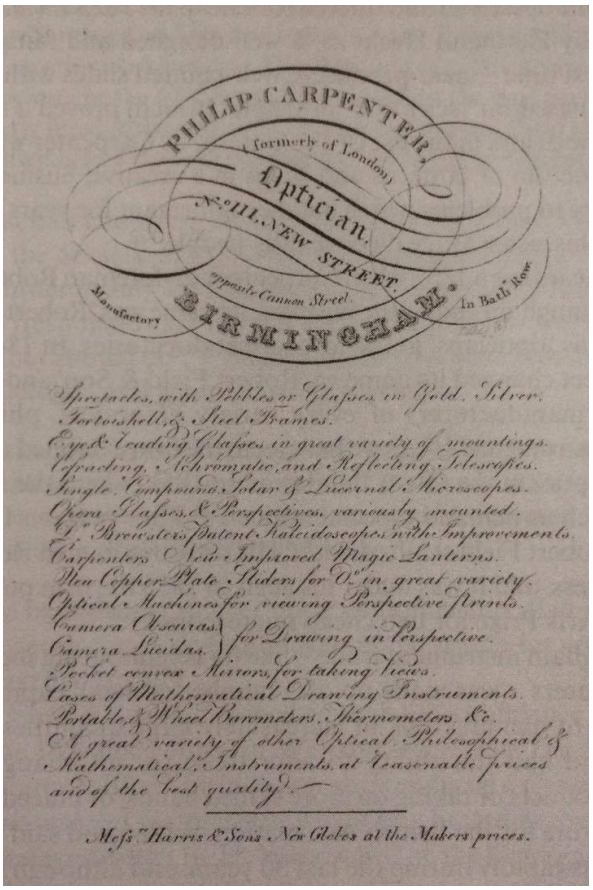
John Bennet
At the Globe in Crown Court,
between St. Ann's Soho & Golden Square,
London.
Makes & Sells all Sorts of Mathematical, Philoſophical and Optical Inſtruments, of Various Materials, According to the Newest Improvements, and Globes from the Latest Diſcoveries, with Books of their Uſe, at Moderate Prices. Likewiſe Inſtruments Alter'd, or Repair'd.
Barometers & Thermometers Retail. Warranted.
Of all kinds Wholeſale or Standard.

Figure 4.
Trade card for John Bennet, 1740.
Science Museum, Ref: 1951-685/10.



Nathaniel Hill, Globe Maker, & Engraver,
at the Globe & Sun in Chancery Lane Fleet Street
London.
Makes and Sells all Sorts of Mathematical Inſtruments in Silver, Braſs, Ivory or Wood, very curious and true graduated both for Sea or Land with Books of their Uſe and the beſt Black Lead Pencils.
N. H. S.
New and Correct GLOBES, of 3. 9. 12. & 15 Inches Diameter.
ESTATES SURVEY'D, and MAPS
Neatly Drawn and Engrav'd.

Figure 5.
Trade card for Nathaniel Hill, 1708-1764.
Science Museum, Ref: 1934-102.



PHILIP CARPENTER,
(formerly of London)
Optician,
No. 111 NEW STREET,
Opposite Cannon Street.
BIRMINGHAM.
Manufactory In Bath Row

Spectacles, with Pebbles or Glaſſes in Gold, Silver, Tortoiſhell & Steel Frames.
Eye & Reading Glaſſes in great variety of mountings.
Opaque, Achromatic, and Reflecting Teleſcopes.
Single Compound Solar & Lucernal Microſcopes.
Opera Glaſſes & Perſpectives, variouſly mounted.
Dr. Brewſter's Patent Kaleidoſcopes with the Improvements.
Carpenters New Improved Magic Lanterns.
New Copper Plate Sliders for Do. in great variety.
Optical Machines for viewing Perſpective Prints.
Camera Obſcuras } for Drawing in Perſpective.
Camera Lucidas }
Pocket convex Mirrors for taking Views.
Caſes of Mathematical Drawing Inſtruments.
Portable & Wheel Barometers, Thermometers, &c.
A great variety of other Optical Philoſophical & Mathematical Inſtruments, at Reaſonable prices and of the beſt quality.

Meſſrs. Harris & Sons New Globes at the Makers prices.

Figure 6.
Advertisement for Philip Carpenter, 1821-1823.
Birmingham Library, Ref: MS 4834/844.

V. Fragments

Beginning with the evidence on Carpenter and his contemporaries—these minor fragments that imperfectly reveal a changing lantern culture—I want to crane my vision outwards towards the large structural changes that occur over the decades. Benjamin has shown how to build a history from the material and discursive fragments of capitalism. His unfinished history of the century follows a methodological framework common to Braudel and other structural historians. Benjamin's historical studies of capital arrange fragments of observations, thoughts, and citations into different thematic bundles. Each juxtaposes a multitude of evidential scraps to reveal key developments in cultural and commercial life. Benjamin shows how new commercial structures (with the covered arcade an emblematic form of commerce) unleashed new conceptions of fashion, novelty, and pleasure (and the lower-class inverse of bourgeois lifestyles—poverty, boredom, drudgery, and insurrection). Benjamin's project aims to extract a picture of changing economic life from the ruins of nineteenth-century capital; using snatches of discourse and knowledge of now empty monuments to uncover different layers of commercial activity. The everyday life of history—the routines and activities through which people's lives are lived—is obscure and ephemeral.

We cannot know history as we know our own lives (lived through trifling, passing moments) but, as Benjamin attempted, we can map its topography—the places and systems that people lived with. We can know the enabling and constraining structures that people worked with (or against). Benjamin's history shows singular events and figures rising out of the mists. They are actualised moments of a virtual past. If we can understand the rules of the world around the instrument makers, we can better understand what typical or exceptional tendencies they point to. Benjamin's project is to reconstruct a city topographically and we can follow him in retracing the spaces, sites, and thoroughfares of exchange, and, more deeply embedded, the circuits of objects, ideas, and money through which nineteenth-century capitalism operated.

As Benjamin shows of consumerism more generally, the nineteenth-century lantern was one example of the exploitation of novelty. Manufacturers and retailers developed innovative practices for the purposes of producing newness. Moreover, as Rossell (1998, 2014) and Wiebe Bijker (Bijker 1995; Bijker, Hughes and Pinch 2012 [1987]) show, they sought to stabilise innovative practices in usable commercial structures.

Let's first outline the material conditions of the lantern and then look to draw out its implied practices. The Phantasmagoria Lantern (fig. 1) was made of black japanned tin, with a tall chimney that angled part way up, to protect the lamp from draughts and to stop light escaping.[14] It had a sliding adjustable lens tube, with double condenser and objective lenses, and a diaphragm to prevent spherical aberration (Barnes 1997: 19-20; P. Carpenter 1995 [1823]: 127-128).[15] This lantern was a significant improvement on earlier models because of the clarity of images produced (due to the lens arrangement), its overall simplicity, and cheapness of manufacture. Older models, including both expensive lanterns (Rossell 2008: 64-66), and cheaper versions (Rossell 2008: 133-135), had less sophisticated lens arrangements. The most common lanterns tended to use a single bullseye lens rather than the adjustable double-convex arrangement of Carpenter's design (P. Carpenter 1995 [1823]: 125) and so were less able to produce uniformly-focused clear images. Carpenter targeted a non-professional clientele, prompting teachers, preachers, gentlemen scientists, and interested amateurs to take up the lantern as a useful way of presenting images in public. As a result, it was important that the lantern was easy to use and produced good-quality images. The style of the Phantasmagoria Lantern, with its black tin body and angled chimney, was one of the most common forms of the instrument until the 1850s, when Newton & Co. introduced a new mahogany-bodied lantern (Barnes 1997: 20).

The accompanying Copper-Plate Sliders were long slides of three or four images on circular pieces of glass, framed in wood (fig. 2). The images were each printed from a copper-plate engraving, fired, and then hand painted (P. Carpenter 1995 [1823]: 126-127). The first set available included eighteen mammalia slides (P. Carpenter 1823a: 4), which presented views of different animals arranged into groups. These were sold with an accompanying reading, which, by 1823, had expanded into a small book (P. Carpenter 1823a). This text also shows that by 1823 Carpenter had expanded the mammalia set to 24 slides and added several more *Zoology* sets: seven slides of birds, five of fishes, four of amphibia, eight of insects, and eight of worms. We can also see from the *Liverpool Mercury* advert that the animal sliders were one of at least seven different sets available by 1822. The slides ranged over humorous

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[14] Japanning was a common way of preserving metal. It was borrowed from the lacquering techniques of East Asian artisans. European japanning was typically of far inferior quality (Robinson, Herbert and Crangle 2001: 146; Loveridge 1967 [1868]: 119-120; Gibbs 1957: 695-698).

[15] Spherical aberration is a defect caused by the transfer of light from a curved objective lens to a flat surface. This produced a projected image that was sharp in its centre but fuzzy at the edges, because the point of focus differs slightly between the centre and edges. This can be mitigated by adding a diaphragm, to reduce the focal difference, and by using compound lens arrangements (Davidson 2011; Robinson, Herbert and Crangle 2001: 213).

subjects, zoology, astronomy, topography, microbiology, and history. They form a network of connected technologies that encourage lantern users to make repeat purchases and add new images and stories to their performance repertoire.

The Phantasmagoria Lantern package used two important practices that would have lasting influence on the lantern trade. The set was commercially innovative because it offered desirable consumer hardware with lasting potential for continuing consumption of new slides. It was also technically innovative because it utilised new manufacturing processes to standardise the form of both lantern and slides. Carpenter successfully created an identifiable consumer package that was branded and advertised in a very modern way. His product was enveloped by an extensive marketing programme (identifying Carpenter by name in advertisements for other consumer opticians: Bird 1818; Bywater 1822: 327), which made it possible for him to exploit it as an identifiable standardised instrument. Desire for branded instruments had rarely been so efficiently exploited by instrument makers in the past.

These innovative practices help to explain the lantern's immediate success, but the way that it became ubiquitous, and its role in the ongoing emergence of the lantern trade, is more complicated. Carpenter was deeply embedded in the manufacturing and retail networks of his era and these all had an effect on his business decisions and the modes of practice he was able to engage in. In order to fully understand the Phantasmagoria Lantern and its effect on lantern practice we need to step back and consider the range of contextual frameworks that intersected with Carpenter's practice. What of other manufacturers and retailers? Or the country's changing economic conditions? The lantern was heavily influenced by the retail context of the era and the public appetite for certain products. Other media devices, such as the Kaleidoscope and Thaumatrope, may provide further clues to the practices utilised to exploit the Phantasmagoria Lantern.

My explanation must outline the different social structures and processes that generate, and are generated by, this paradigm. As Braudel argues, we must not deal only with individuals but also with the underlying structures that enable, constrain, and direct the actions of individuals (1982 [1979]: 458-461). Historical moments are the sum of different living realities (1982 [1979]: 458). They form a visible peak of many related systems and trajectories, themselves rippling outwards to connect with other events. As Braudel says, social reality 'requires and implies the existence of other collections of variables outside itself' (1982 [1979]: 459). In order to fully understand the importance of the Phantasmagoria Lantern to the early expansion of consumer media

we must chart the structures and processes around it. This will impose divisions around variables that are strictly continuous in history.

I have identified an event—the release of the Phantasmagoria Lantern—that scholars are agreed had a formative impact on lantern history. I have described its core components and presented evidence of its discursive framing in advertisements. We know that the new lantern was successful and that its form remained in use into the second half of the century. But we may note cracks in Carpenter's claim to invention. There were other, lesser-documented practitioners operating around him who may tell quite different stories to the common technical teleologies. What were these people doing? Can they demonstrate if Carpenter was a typical or deviant practitioner? Further, can we test what the new lantern actually did? The consensus, as it stands, claims that the instrument had significant impact—but what new forms of media did it enable?

Lantern retail began to solidify into a formal market over the 1820s, 1830s, and 1840s, and this had many different causes. I have selected the Phantasmagoria Lantern as an emblematic moment in the expansion of the trade because it framed the lantern as a consumer package and because Carpenter's influence is visibly suggested by the surviving evidence. I will now explore the world of domestic media that this lantern plugged into, before going on to trace the common elements of media practice across the instrument makers, and other trades.

I show how the magic lantern moves towards ubiquity in popular visual culture and the early stages of a lantern trade emerging from broader clusters of instrument makers, entertainers, and retailers. Over the following chapters, I reveal these conditions by more closely engaging in the frameworks that encircle the Phantasmagoria Lantern, and which determined its success. I address the lantern in relation to domestic media use, public attitudes towards science and spectacle, its broader retail market, and production infrastructure.

Chapter 2.

The Domestic Phantasmagoria

I. Unseen Lantern Shows

At the centre of this converging cluster of historical trajectories is the Phantasmagoria Lantern itself. All of the enabling economic conditions and manufacturing infrastructures supported a form of anonymous domestic media practice. The Phantasmagoria Lantern was bought by real people, who used it in diverse ways. Some, following Carpenter's instructions (1995 [1823]), stretched a wet sheet across a doorway to act as a makeshift screen. Some perhaps devised new and surprising uses. There is a fleeting moment at the heart of this paradigm that projects outwards towards all the media transformations of the century. The gradually expanding lantern trade, the increased prosperity of its makers, the growing consumer market, and rising popularity of the device were all driven by mundane moments of domestic lantern use. These moments are difficult to properly describe, because so few of them were ever considered worth documenting. As Meredith Bak shows, domestic lantern performance is mostly absent from discourses on media spectatorship (2015).

The surviving evidence can illuminate the shape of domestic lantern performance. It demonstrates what expected use patterns were programmed into the lantern, what prevailing attitudes could have influenced domestic performance, and what unexpected modes of performance were possible. There are fictional accounts of domestic performance that can (cautiously) suggest viable practices and lantern manuals that suggest approaches. This chattering around the domestic lanternist does not add up to any clear knowledge, given the diversity among thousands of untrained users. It can only give a suggestive summary that does not stand for any one individual. What follows reveals indicative practices assembled from evidence of different anonymous, possible, and imagined performances. I will show what kind of lantern practice Carpenter's new machine enabled. In the next chapter we will move deeper into the retail networks to find other professionals plugged into this same mode of practice.

II. Domestic Lantern Practice as Programmed by Carpenter

Carpenter's companion to the lantern provides instructions for use, suggesting a viable framework for domestic lantern shows (1995 [1823]: 129-131). The lantern would barely ever be used exactly as intended, and doubtless many people used their lantern against its maker's expectations, but these guidelines provide a plausible starting framework. According to the instructions, users should trim the lamp with oil 'to make it burn brilliantly' (1995 [1823]: 129), then set the lantern on a table eight feet or so from a white wall (or a suspended white sheet). The room should be dark and the lanternist should sit at the table, facing the wall, and insert a slide with one hand, sliding the lens tube with the other until the image appears in focus. In this way 'the natural history subjects may then be given in their natural sizes with the utmost facility' (1995 [1823]: 129).

The lantern can be used standing: 'Instead of placing the lantern on a table, it is often more convenient to hold it under the arm, or it may be fastened round the waist, as directed for the phantasmagoria, taking care to keep it upright' (1995 [1823]: 129; fig. 7). This would be needed for phantasmagorical effects, as in the lantern's namesake, to make figures advance out of the darkness.

> For this purpose, instead of the image being exhibited on a white wall or sheet, it is thrown on a transparent screen placed between the spectators and the lantern. The screen not being seen, the image appears to be suspended in the air. (1995 [1823]: 129)

Few surviving Phantasmagoria Lanterns (by any maker) have visible means of fastening around the waist. There is a fixture on the back of the Darmstadt lantern to fit a belt, while Huhtamo has one with an extant belt attachment (Willis 2012: 6-7; fig. 9). Some have handles for handheld exhibition (Willis 2012: 7; fig. 10). There is no way of knowing how commonly this was done by domestic lanternists. Tin lanterns tend to get very hot, making a full performance with one pressed into the midriff (as in engravings; fig. 7) potentially uncomfortable.[16] A later reprint of the same engraving (fig. 8) replaces the belt-lantern with a standard Phantasmagoria Lantern held by the lanternist, suggesting that the belt-attached lantern was later abandoned. It would certainly not have been used in this fashion every time, but some would have tried to produce a

[16] This could be mitigated through some kind of protector, although there is no evidence of any such implement being used. Through my experiments with a Phantasmagoria Lantern, I can confirm the discomfort of operating a tin lantern against the body. In one instance, I was left with a quite painful burn on my stomach. My own lantern was lit by a regular incandescent bulb; I can only imagine the heat produced by an Argand lamp.

home Phantasmagoria; to project a zebra suspended in the air, as in the engravings, or to haunt a darkened drawing room with a condor or a crocodile or Richard III.

Further instructions are provided for giving motion to the figures:

> The images may be made to move in a circular, elliptical, or other direction, by moving the lantern in the corresponding way, which will of course produce the like motion in the images. […] A shivering motion may be given to the images by giving the lantern a sudden shake. By standing at the bottom of a pair of stairs, a figure may be made to appear going up, by giving the lantern a slight angular motion; the figure of a skeleton is a very good one for this purpose. (1995 [1823]: 131)

Many domestic lanternists would have followed these instructions carefully, giving movement to the animals in the accompanying slides. One imagines the delight in making a giant turtle swim about a room or enlarging a lion to frightening proportions. If these instructions were followed, the Phantasmagoria Lantern could have produced an interactive multi-dimensional performance that is quite unlike the static lantern shows most commonly described.

But what of these performances? What underlying conditions did they imply? I have identified a new kind of lantern as an early transformative moment in the emergence of the lantern trade and outlined an indicative domestic performance for its social use. I have made an initial case for structural analysis and argued that we should look for broader discursive, retail, and production networks to understand this transformation. Among the conditions that determined the form of Carpenter's lantern, and its eventual success, were changing attitudes towards science and spectacle. Carpenter framed the Phantasmagoria Lantern in a context of practical education to capitalise on broader discourses on education and respectability. Yet he retained some of the lantern's long-standing associations with wonder and sensationalism.

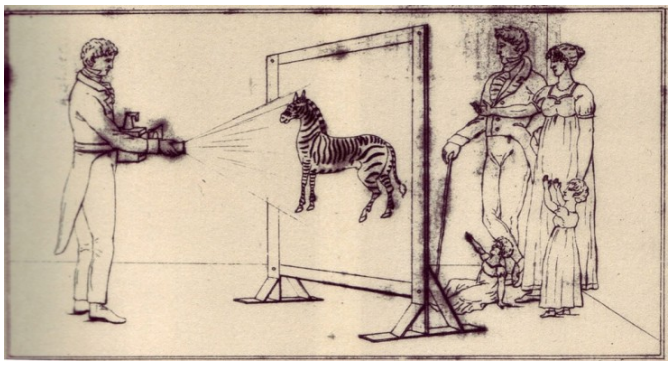

Figure 7.
Engraving from ‘A Short Account of the Copper-Plate Sliders, and a Description of an Improved Phantasmagoria Lantern’ (P. Carpenter 1995 [1823]).

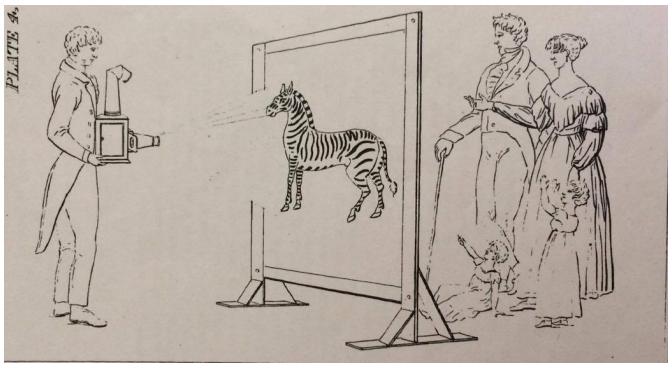

Figure 8.
Engraving from *A Companion to the Improved Phantasmagoria Lantern* (Carpenter & Westley 1850).



Figure 9.
Erkki Huhtamo with belt-attached Improved Phantasmagoria Lantern by Philip Carpenter [missing chimney digitally added], 1821-1826.



Figure 10.
Phantasmagoria Lantern, 1820-1840.
National Science and Media Museum, Ref: 1929-467 Pt1.
With handle and inbuilt Argand lamp.



Figure 11. Subjects in Natural History, 1821-1836.
Museo Nazionale del Cinema, Ref: M04311/005.
Mammalia: Zebra, Hippopotamus, Tapir and Cretan Sheep by Philip Carpenter.

III. Disreputable Visions and Scientific Projection

Increasing interest in popular science and practical education provides one explanation for the reframing of scientific instruments as consumer objects. Retailers exploited this interest by reinterpreting older models of scientific spectacle and natural magic (Daston and Park 2001). Lanterns, microscopes, and optical toys were framed as machines that presented wondrous visions before the eyes of new audiences (Stafford 1994); but they were also contextualised as worthwhile educational instruments. The popularity of optical instruments coincided with the first stages of the nineteenth century's growing fascination with scientific spectacle (Lightman 2007: 167-218; Morus 2006, 2012; Morus, Schaffer and Secord 1992). Successful negotiation of a dichotomy between science and entertainment (Morus 2017; Hankins and Silverman 1995: 37-71; Hunt 2008) helped retailers expand their market reach, attain respectability, and make substantial profits. *A Manual of Optical Instruments* shows how effortlessly lantern discourse aligned science with wonderment:

> No one, however bilious his complexion, that has witnessed the optical pleasantries of a dark room and a white curtain, can have helped laughing heartily. […] There is a glorious peculiarity about the magic lantern, it requires no preparatory course of study to enable people to understand its very lucid designs; and another thing, it admits of that change of subject, which renders it an inexhaustible source of merriment. […] And then what an air of scientific refinement surrounds it! If you see a youth with a strong taste for the lantern, you may safely prophesy that the philosophic genius of a Newton will sooner or later develop itself, and that he is destined to throw light, not only upon his mamma's white table-cloth, but upon the broad field of science. (Doublet 1850: 35)

But the lantern was also embedded in a long-standing discourse on impermanence and disreputability. It had earlier been thought a fleeting trifle and was commonly used as symbol for all manner of ephemera: a newspaper, for example, was a 'magic-lantern, through which we behold all the great and little changes on the theatre of the world—the bubbles which alternately sparkle and disappear on the stream of time' (*Reveries of a Recluse* 1824: 35-36). A woman could take a host of lovers that appeared and vanished 'like figures in a magic lantern' (Edgeworth 1812: 275); and a man view a future spouse as a lantern, 'to him, a magic lantern indeed! for, strange and wild were the shapes which, through its agency, his future life assumed' (Lover 1843: 16).

Carpenter's intervention drew on existing connotations and made a case for the lantern as something worthwhile and exciting. His marketing discourse emphasised education and practical science, so as to disassociate the instrument with connotations of disreputability or unimportance. But his language betrays the naive wonderment of the lantern's previous lives in the hands of the necromancers, itinerants, and Phantasmagores. Carpenter's consumer lantern only projected the outward appearance of an educational device.

The lantern started its life in the cabinets of early scientists, but shed its associations with natural philosophy over the second half of the eighteenth century. It became a machine for public exhibition, no longer visible in serious scientific writing. Rossell summarises:

> The learned scientists of the Enlightenment who devised and developed the magic lantern as one of their demonstration instruments […] soon gave the magic lantern a secondary, or even tertiary place amongst their instruments: it neither accurately measured physical properties, nor capably proved contentious theses; it was not, in the end, what they considered a mathematical apparatus. (2008: 17)

The lantern's disappearance from scientific discourse occurred as a result of changes in the conception of science towards the end of the seventeenth century, entering the Enlightenment period of scientific philosophy. Daston and Park show that the changing science did not simply debunk earlier conceptions of the marvellous (long linked with natural philosophy), but that it underwent a discursive shift so as to exclude wonderment from scientific interest (2001: 361; Stafford 2001: 79). By the eighteenth century, the lantern, preeminent device for presenting marvellous things, was no longer of scientific concern.

As early as the 1740s, Jean-Antoine Nollet had described the decline of the lantern's reputation. He said that too great a fame had made the lantern ridiculous (1783 [1743-48]: 567). A satirical dialogue by Benjamin Martin projected such contemptuous attitudes backwards to the necromancers:

> *Euphros.* I only joke with you, *Cleonicus,* as I know the Reputation this Instrument is in.—But, pray, how comes it to be called the *Magic* Lanthorn?
>
> *Cleon.* From the wonderful Effects which it was observed to produce, by the stupid and superstitious Part of Mankind, and the Villainy of

> Cheats and Imposters. For, on the first Invention of this and such like Instruments, it was well known how the Minds of ignorant People would be influenced by such amazing Effects; and as it was easy to conceal the Cause, the Conjurer had it, by this Means, in his Power to work Miracles, and multiply the Experiments of his Magic Art; and it is not to be doubted, the Tribe of Miracle-Mongers found their Cause of Imposture to be as much promoted, by this Instrument, as by any one Instrument that ever fell into their Hands. (1781 [1755]: 285-286)

Changes in the status of lanterns among scientists and itinerant entertainers (for whom it represented just one, increasingly unspectacular, travelling curiosity) meant that Carpenter's retail practice lacked continuity with earlier iterations of popular lantern culture. His strategy was intended to rehabilitate the lantern among his wealthy clientele, so as to make it a respectable apparatus, as worthy of attention as a microscope or telescope.[17] This is evident from the accompanying booklets, which attempt to prove the lantern's usefulness for teaching zoology, botany, and astronomy (P. Carpenter 1823a; Carpenter & Westley 1838, 1849).

This impulse towards respectability intersected with another key marketing drive to present the lantern as an exciting and desirable object. As instrument makers increasingly targeted the domestic market, they would inject their instruments with a sense of pleasure to capture attention of amateurs. But they would have to tread a fine line between respectability and wonderment. Carpenter could not afford his lanterns to be perceived as dubious trick machines, nor his microscopes as boring academic instruments. His instruments had to be reputable in order to fit the tastes of his target demographic, so his marketing materials emphasise their educational and scientific nature. But it was equally important that the scientific world they revealed, through lantern slides or microscopic objects, was wondrous.

IV. Zoology and Practical Education

The copper-plate printing process allowed Carpenter to standardise his slide output. He sold a consistent series of recognisable slides that were marketed as branded

[17] As Rossell points out, an early use of the lantern among scientists was as an instrument for teaching (2017; Hankins and Silverman 1995: 48-53). Johann Conrad Creiling, professor of mathematics at Tübingen, suggested preparing lanterns slides for history, geography, zoology and mathematics in 1705. The instrument makers of the early nineteenth century were not the first to frame the lantern in an educational context, but they had to reestablish the lantern as an educational device in the popular imagination, which, by then, had come to associate it with charlatanism and vulgarity.

commodities. They were interpreted through accompanying literature that gave information on each subject. *Elements of Zoology* (1823a), the earliest surviving companion, provides zoological information and amusing stories to accompany the natural history slides. The text outlines a broad context of learning as a means of justifying their use (and the value of natural history). The zoology slides commercialised contemporary concepts of collecting, structuring the varied signatures of life into linear classifications (Ritvo 1997). Carpenter's lantern would be used like a cabinet of curiosities to contain the vastness of the natural world in a series of educational tableaux.

Barbara Stafford argues that there is something of the old cabinet in a magic lantern:

> The sensory heightening of palpable objects through their forced proximity in an enveloping cabinet has a remarkable parallel in the spatial compression achieved by optical instruments. The spectacles, prisms, mirrors, microscopes, telescopes, magic lanterns and camera obscuras of the time also produced perceptual, imaginative, and intellectual intensification. These capturing devices focused, abstracted, enlarged, diminished or multiplied objects. They gathered together divergent messages received from the cosmos and projected them in brighter, sharper form.(2001: 6)

Educational and imaginative content could be organised in slide sets and interpretive companions. The lantern provided a different mode of information retrieval than a cabinet or textbook, but all drew on the same impulse towards classification and collecting.

The format of *Elements of Zoology* is fairly typical of popular zoology texts from this era. These books, intended for child or lay readership, set species of animal into genera and orders and provided descriptions alongside woodblock, copperplate, or lithographic illustrations. The most famous of these books were Thomas Bewick's *A General History of Quadrupeds* (1980 [1790]) and George Shaw's *General Zoology* (1800-1826). Bewick's book is oriented around its woodblock illustrations, with simple descriptive passages providing background information for the reader. The Shaw text is more detailed, setting out information on individual animals and building these into a classification system. The content of both texts is very similar to Carpenter's companion. The larger literary organisations of animal life were reiterated by the new consumer lantern.

There are many similarly-titled books devoted to essentially the same purpose, each documenting the animal world in various sober or sensational styles. *The Natural History of Quadrupeds* (1801) presents a serious classification of mammals, as part of an ambitious attempt at a comprehensive synthesis of science and religion for young readers. *The Cabinet; or a Natural History of Quadrupeds, Birds, Fishes and Insects* (1801) presents copper-plate illustrations alongside thumbnail summaries of different animals. This approach is also followed by J. Macloc's *New, Complete and Universal Natural History* (1813). Most popular zoology texts of the period are identical in format to the Carpenter text, albeit at far greater length. They include hundreds of individual entries and images. *The Cabinet* claims 'figures of above seven hundred animals'.

There were also many simplified versions of the zoological textbook. *Natural History of Quadrupeds, for Children* (1824) by A. Lady follows the same illustrative impulse. Here the animals are selected for their vicarious interest, over any real educational content. This is repeated in F.O. Morris's later *Book of Natural History* (1852), Robert Huish's *Wonders of the Animal Kingdom* (1833), Frederic Shoberl's *Natural History of Quadrupeds* (1834), and Henry Althans' *Scripture Natural History of Quadrupeds* (1828), where zoological history is again synthesised into Christian knowledge. Most of the earlier books, particularly Shaw's *General Zoology*, were huge, comprehensive exercises in classification. These later texts are lighter affairs in the spirit of Bewick's illustration-driven *General History*. Some provide very short accounts of animals, rough sketches to stand for the expanse of zoological knowledge; others contain only a handful of interesting animals to stand for larger kingdoms. Carpenter's *Elements of Zoology*, limited in scope by the practicalities of slide production, follows this schematic tendency.

The existence of these popular zoology books shows that there was a market for entertaining reinterpretations of the larger classification texts.[18] It is easy to see how a lantern version of such texts would suggest itself. The books can be easily compressed into short commentaries and their systematic arrangement of information suggests the sequential structure of a lantern performance.

Other books bear even closer similarity to lantern performance. Louisa Lovechild's *Natural History* (1833), a chapbook intended for a juvenile audience, provides summary descriptions of animals alongside colour illustrations. Given the

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[18] Some of Carpenter's other slide sets are reflected by popular educational literature. There are, for example, contemporary texts dealing with botany, such as *A Familiar Introduction to Botany* (1800) and *Conversations on Botany (*1817), both with copperplate illustrations and both following the descriptive format of Carpenter's *Compendium of Botany* (Carpenter & Westley 1838).

book's paltry length and young readership, it does not bother with systematisation, preferring standalone entries on individual animals. This is a viable format for a zoological lantern performance. Given the linear nature of slide sequences, it would be difficult for a lanternist to provide very much in the way of classificatory system. The simplicity of Lovechild's book, linking short descriptive entries with colourful illustrations, is highly suggestive of a possible lantern performance.

V. The Wonder of Animal Life

Elements of Zoology betrays the non-scientific concerns of Carpenter's consumers. It was necessary for the lantern to be seen as a reputable instrument, as we have seen, but it also had to be exciting enough to draw sales. As a result, the content of the interpretive reading is entertaining rather than educational. Some extracts should illustrate this:

> Viverra Furo, or *The Ferret.* The ferret is a native of Africa, but has been tamed in Europe, and is used for rabbit hunting, and also for clearing places infested with rats. It is very susceptible to cold, and is kept in a box provided with wool. So great is its thirst for blood, that is has been known to grasp at the throats of infants in the cradle, and suck them till it has been completely gorged. (1823a: 35; fig. 12)

> Vultur Gryphus, or *The Condor.*—This, with the exception of the ostrich, is the largest of birds, and its amazing size and strength almost realizes the accounts of the Roc, in the Arabian Tales; when full grown it sometimes measures sixteen feet when the wings are extended, and is capable of snatching a small boy of ten years of age and upwards. The fulness of its plumage is such as to resist a ball fired at it from a gun. (1823a: 76-77; fig. 13)

> *Genus Testudo*, or *The Tortoise Tribe.* This genus is divided into three assortments, land tortoises, river tortoises and sea tortoises, or turtles. They feed upon worms, the marine ones on sea weeds; when tamed they eat almost anything. They are long lived; one kept in the gardens of Lambeth attained the age of 120 years, and they are so tenacious of life, that one lived six months after its brain was taken out, walking about as before. Another lived twenty-three days after its head was cut off, and the head opened and closed its jaws for an hour after its separation from the body. (1823a: 97; fig. 14)

> Lacerta Crocodilus—*The Crocodile of the Nile.* This enormous animal inhabits the Nile. It is of amazing strength and swiftness, and extremely voracious; both its jaws being movable it can open its mouth to a vast extent. It preys chiefly on fish, but occasionally seizes men, and almost every animal which happens to fall in its way. Specimens have often been some twenty feet in length; and there are accounts of some which have exceeded thirty feet. The body is covered with a curious kind of armour resembling carved work, which on the upper side is so strong as to repel a musket ball. Its roar is hideous. (1823a: 100; fig. 15)

These readings are more concerned with sensationalism than accuracy, and it is easy to imagine the pleasure they may have given an audience.

This language is mirrored by the more dubious zoology textbooks. In Lovechild's *Natural History,* an eagle possesses 'very great strength of talons, so much so, that they can with ease carry off large animals, such as lambs, turkeys, &c., and have been even known to bear away young children' (1833: 2). The crocodile has armour 'which appears like beautifully carved wood […] and is so impenetrable as to resist musket-balls' (1833: 8). In Morris's *Book of Natural History* the eagle 'is feared for its great strength and fierceness, and is reported not to hesitate in attacking individuals of the human race; nay, that instances have been known in which persons have fallen a sacrifice, their skulls having been fractured by the blows of beak and talons' (1852: 208). Sensationalism was typical of popular zoology, overriding pure educational concerns. Animals were repeatedly noted for their strength, fierceness, and likeliness to repel a bullet.

Many of Carpenter's slides are direct repetitions of the *Cabinet* illustrations, by Edinburgh engraver John Buego, with figures matching in detail and pose (fig. 16).[19] Given its unusual arrangement, it is not possible that the eagle slide accidentally repeats the *Cabinet* engraving—it must have been consciously taken from this (or an earlier) source.[20] Extensive paintwork was added to the printed designs when preparing the slides, so it is difficult to prove direct repetitions, especially considering

---

[19] Some of the *Cabinet* engravings are, in turn, repetitions of Bewick's quadrupeds. I am not interested in proving authorship. This demonstrates how artists were constantly stealing from each other. Carpenter is part of a common pool of ideas and approaches.

[20] The Buego and Bewick engravings are the earliest datable source for the natural history sliders, but not all of the images are present in these publications and not all are direct matches. There are likely other sources. There are also striking similarities between illustrations in different books, particularly the side-profile quadrupeds, indicating that engravers followed similar approaches to representing animals and that plagiarism was common across the trade. Trade engravers were part of a commercial network with its own practices and traditions (Tattersfield 2014).

that many of the illustrations show only simple side-profiles. It is possible that the slides were direct copies, or even that they were prepared by the same engraver. Carpenter was connected to Edinburgh through David Brewster, so it is plausible that he might commission Buego to prepare the matrices for his slides. In any case, the genealogy of the images proves that Carpenter was aware of these popular zoology books and that he adapted this format to his lantern output. He embedded his slides in an educational discourse and marketed them in line with respectable middle-class values, while still echoing other popular, fantastic, or spectacular energies.



Figure 12. Subjects in Natural History, 1845-1860.
Museo Nazionale del Cinema, Ref: M06155/004.
Mammalia: Ichneumon and Civet Cat—Polecat and Ferret—Striated Weasel and Chinche, by Frederick Cox of Newgate Street, after Philip Carpenter.



Figure 13. Subjects in Natural History, 1836-1860. Phillip Roberts collection.
Birds: Condor—Fulvous Vulture—Golden Eagle—Barn Owl, by Carpenter & Westley.



Figure 14. Subjects in Natural History, 1836-1860. Phillip Roberts collection.
Amphibia: Snake Tortoise—Green Turtle—Horned Frog—Pipa, by Carpenter & Westley.



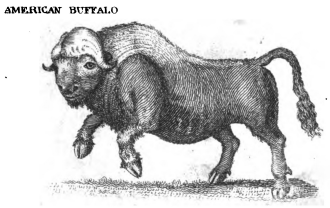
Figure 15. Subjects in Natural History, 1836-1860. Phillip Roberts collection.
Amphibia: Flying Dragon—Crocodile—Dracæna Lizard—Basilisk, by Carpenter & Westley.

Figure 16.
Comparison of images from *The Cabinet* (1801) and Carpenter's Natural History sliders.



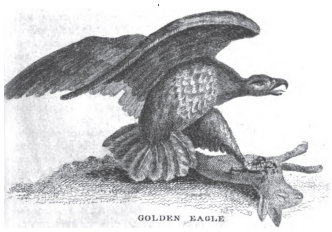


Wallachian Ram (1801: section 1, pl. 3) / Cretan Sheep (MNC M04311/005).





American Buffalo (1801: s. 1, pl. 2 / MNC M04311/006)





Golden Eagle (1801: s. 2, pl. 3 / PR).



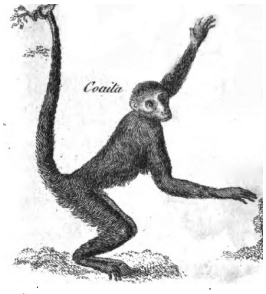


Gibbon (1801: s. 1, pl. 17) / Long-Armed Ape (BDM 64539/1).





Zerda (1801: s. 1, pl. 34) / Fenec (NSMM 1990-5036/11533).



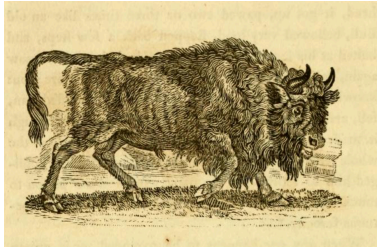


Coaita (1801: s. 1, pl. 19) / Coaita, or Four-fingered Monkey (MNC M02543/001).





Porcupine (1801: s. 1, pl. 39 / PR).





Urus, or Wild Bull (Bewick 1790: 42) / Bison (BDM 64539/14)
[sometimes it is not clear if an image is from a different source, or if the painter has altered it beyond recognition].

VI. How Was the Phantasmagoria Lantern Used?

Carpenter's commercial innovations and marketing strategies coalesce in a moment of use. I will conclude with some reflection on domestic lantern performance, to show how the media revolution of the 1820s enabled new forms of amateur projection. It is impossible to know how closely the information and structure of *Elements of Zoology* was followed. The text suggests a possible performance, but this must have been indiscriminately cut, altered, and ignored by lanternists.

There are no explicit instructions on how to convert the information into a descriptive commentary. The companion is presented as an educational text in its own right. Aside from the contents, which lists the figures on each slide and provides corresponding page numbers, the companion does not indicate which parts of the reading correspond to individual images. This means that there is some leeway in presentational strategies, even if the lanternist had intended to stick closely to the text. It is fairly obvious that the information about porcupines should be read while projecting a porcupine, but there is much additional text that has no clear illustrative partner. Certainly, the performer would have been unlikely to read out all 169 pages.

It is probable that the text was intended as an educational supplement to help the lanternist assemble an abridged performance of their own. Granville Ganter has found a copy of Carpenter's *Companion to the Magic Lantern* (1823b), owned by a professional lecturer called Laura Clarke, who gave educational lantern shows around the northeast United States in the 1820s (2014). This booklet bears marginal notes that show how she had supplemented the text with content of her own, transferring information on the English Kings and Queens to an American context. It is likely that most professional and domestic performers would have similarly repurposed the content of the slides to suit their own circumstances. A complete framework cannot be extracted from the companion texts alone; we have to use additional evidence to plug the gaps.

Performance styles were enormously varied. Even when lantern shows followed slide readings, as was more common later in the nineteenth century, there was significant deviation from the source text to accommodate lecturers' stage personalities (Crangle 2004). Kember shows how lantern performance was part of a wider field of lecturing and stagecraft that played with performance content and style (2009: 44-128). The domestic lantern was new to all but the most wealthy, but users may already have been familiar with other modes of performance. Kember shows the interplay between popular stagecraft and more authoritative scientific modes of address, revealing the

uneasy relationship between entertainment and educational performance. It is unlikely that purely educational domestic performances were very common. *Elements of Zoology* is presented in a dryly informative context, but this is undercut by its language and the pleasing spectacle of the images.

Most literary depictions of lantern shows at this time emphasise spectacle over content. It is likely that domestic performances followed suit, with performers using their lantern, slides, and companion in unique and surprising ways. Some perhaps presented wordy accounts of Linnaean classifications, others may have departed from zoology to tell tall stories about animals, more closely reflecting the sensational facts of the text. It is impossible to build a true reflection of the varied modes of performance enabled by the Phantasmagoria Lantern, but we can look to depictions of lantern performance to ascertain possible modes of performance.[21]

VII. Literary Lantern Shows

As the popularity and fame of the lantern increased, it appeared in more and more literary works (Bottomore 2005). There were many narrative descriptions of lantern shows. Some, like *Paul Pry's Magic Lantern* (n.d. [c.1840]) and *Sergeant Bell and His Raree Show* (1839), presented colourful and romantic depictions of a lanternist wandering the countryside. Some, such as *Lily's Magic Lantern* (Barker 1880) and *The Juvenile Gardener* (1824: 19-21), revolve around children discovering the instrument and its possibilities. Other texts provide advice on how to use the lantern in various sober or playful styles. Instruction texts became very popular later in the century (Kember 2009: 65-68), but early versions included the *The Magic Lantern: Its History and Effects* (1854), *The Wonders of Light and Shadow* (1851), and *Fun For Winter Evenings* (West 1833). Still others frame lantern shows in the context of philosophical or educational conversations, using a lantern performance to prove some point about perception, physics, or morality. This genre includes *Philosophical Conversations* (Bakewell 1833: 207-211) and *The Young Gentleman and Lady's Philosophy* (Martin 1781 [1755]: 285-294).

The performances presented in these texts tend to feature disconnected images accompanied by dialogue or rhymes. *Fun For Winter Evenings* provides samples of comic dialogue:

> Lord help you, I am old and tough,
> But sound in constitution;

[21] Anette Duller has used a similar approach with Dutch-language sources (2014b)

And I remember well enough
The damn'd French *'Resolution'.*

Such dreadful days were never seen,
We liv'd in daily fear;
What with that bloody guillotine,
And that *Sir Robert Spear.* (West 1833: 12)

The author Francis West was an instrument maker and probably produced this booklet to accompany a series of lost slides. The commentaries proceed thematically, rather than narratively. Commentary for a slide called 'What A Shocking Bad Hat!' is followed by 'What A Shocking Bad Bonnet!' (1833: 13). 'Irish Whiskey' is followed by 'Scotch Whiskey', 'English Gin', 'Jamaica Rum', etc. (1833: 15-17). There are sequences on different tradespeople (1833: 25-32) and everyday characters (1833: 32-45).

A rare surviving set of notes for a lanternist called Timothy Toddle, discovered by Ron Morris, shows that loose organisation of subjects was also practised by real-world lanternists (1990 [1841]). The Toddle notes show that he presented views in the same format—shifting between disconnected images (a clown, then a pony, Eddystone Lighthouse, and an astronomer, followed by the adventures of John Gilpin) and thematic clusters (several slides on wild beasts and famous portraits). Occasionally, several slides would join together into mini-narratives presenting comic sequences or exciting events. There is a three-slide sequence on Vesuvius and the destruction of Pompeii, a two-slide Robinson Crusoe, and abridged single-slide adaptations of Hamlet and Macbeth (Buchanan 2009, 2012), interrupted by Paul Pry, the comic entertainer from the story. Toddle's notes for a commentary reveal an unexpected shift from dramatic to comic description:

[Slide] 38 The Combat Between McDuff & Mackbeth
[…] At length they meet in Battle. McDuff cries out Then yield ye coward & live to be the Show & Gaze of time
I will not yield & so lay on McDuff—
and death to him who first cries hold enough
[Slide] 38A Paul Pry—I hope I don't intrude—I've just lookd in to see whats going forward and hope to have a slice of Cake bye & bye (1990 [1841]: 51)

This loose chain of views and sketches was the most common approach to lantern performance in this era. Lanternists presented discrete views and descriptions in uncoupled sequences. There are cases of greater narrative continuity, for example in

Paul Pry's Magic Lantern, where each view illustrates the showman's travels, but even this is framed in discrete shifts to exploit the comic potential of discontinuous content.

The majority of lantern shows remained linear and discrete in organisation, because the apparatus of slide projection was built this way. More complex mechanical slides were only just starting to become available. The most common slides were multi-image sliders or continuous single-image panoramic sliders. The constraints of the technology structured the format of lantern presentation.

Slide producers sold thematic slide sets (on zoology, astronomy, botany, etc.) and larger sets of disconnected views. Carpenter sold sets of discrete images ('Movable Humorous Sliders, Upwards of 150 different Subjects', 1834: 23). The Media Museum has a boxed set of 36 miscellaneous views by Carpenter & Westley (fig. 17). Narrative slide sets did not become common until later in the century. Stories and sketches were performed in linear episodic sequences because of the discrete images on the slides and, further, because the performance traditions of lanternists were derived from earlier illiterate performers and itinerant practices. This is reflected in the literature.

Many of the performances described are more concerned with the pleasures of looking. The lanternist in *The Gentleman and Lady's Philosophy* was concerned solely with directing attention to the visual qualities of his slides (depicting a royal procession):

> Good heavens! The Herb-Woman appears at a greater Advantage than when I saw her on the Platform at the Time. The Painter has certainly complimented her six Maids.—The Flowers lie as naturally on the Carpet as I then saw them,—A delightful Appearance, indeed; […] I really judge this View, by Candle-light, much to exceed that by Day-light. (1781 [1755]: 288-289)

His commentary privileges spectacle and verisimilitude over intellectual content. This is also evident in the Toddle and West descriptions, which express an ocular fascination with the beauty or visual interest of slides. This was fairly typical of lantern shows in general, and would very likely have transferred to the domestic sphere, where the novelty of the instrument must have been a considerable attraction.

This provides various suggestions for an indicative domestic performance. We know that lanternists would deviate from source texts and that their performances would usually progress in short, stuttering sequence, with one view following another. Slides were more likely to be thematically or conceptually linked than joined by narrative. Each view could be accompanied by extensive descriptive, comic, or

informative commentary. There was an uneasy relationship between these approaches, with lanternists often shifting between educational and spectacular modes of address, sometimes driven by the wonderment of images, sometimes by interesting content.

I will use this set of typical practices to suggest an indicative domestic performance. This performance follows evidence from various sources, but does not match any one in its entirety. The domestic lanternist occupied a place at the intersection of professional, literary, artistic, and discursive manifestations of lantern culture. They would have interpreted this culture and used their equipment in varied and surprising fashions. Because the Phantasmagoria Lanterns were used by so many thousands of people, we may assume that they were used (if only once) in almost every imaginable way. What follows is one possible domestic performance.

Figure 17. Box of slides on various subjects, 1867-1880.

National Science and Media Museum, Ref: 1951-312.

By Carpenter & Westley. Slides shown: Interior of York Minster, St. Paul's viewed from across the Thames, the Fenian Bombing of Clerkenwell, Bacchus delivered by Mercury, the eruption of Vesuvius, and Brunel's SS Great Eastern Steamship.





VIII. A Zoological Lantern Show[22]

A bright winter morning in Birmingham. A fat little man with tired eyes, thinning hair, and a thick, protruding lip is leaving a shop at 111 New Street with a large package bundled under his chin. He is wearing a tatty long topcoat that covers a rather better, but still wrinkled, dress jacket and tie. He has decided to become a lanternist, and so has purchased the very latest thing: An Improved Phantasmagoria Lantern and set of zoology sliders. He has wedged a little booklet between the box and his well-groomed beard. When he arrives home he will study this booklet, and others, and prepare a magic lantern show for his family. If they don't, again, ignore his invitation, he may also perform for some work colleagues and his bridge partner.

> When the evening came a sheet was fastened up […] in the dining room, the lights were all put out, except that in the magic lantern, and the children sat in a row watching the sheet with little eager faces to see the first picture appear. (Barker 1880: 11)

Following the instructions, our lanternist has hidden behind the sheet, lantern belted to his waist. His first slider carries a human skull, an orangutang, a long-armed ape, and a baboon (fig. 18). The room is dark and the spectators wait patiently. An Argand lamp is lit inside the lantern. The little man slides the skull inside and removes his hand from in front of the lens tube. The skull appears suddenly, big and threatening, if a little out of focus. The lanternist quickly adjusts the sliding lens tube and the skull solidifies into sharper view.

> It appears to the spectators to approach, or recede from them. The deception is so complete, that even those who are accustomed to the exhibition, and know where the screen is placed, are deceived by it. (P. Carpenter 1995 [1823]: 129)

When studying his descriptive booklet, the man had found no accompanying dialogue for the skull, but, knowing a little something of the (lesser) Phantasmagoria showmen, and eager to impress his spectators with a little theatre, he improvises an introduction of his own:

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[22] This section is built from sources on domestic and professional exhibition and acquired knowledge from years of working with lanterns and slides. Experimentation with handling and operating Phantasmagoria Lanterns has provided tacit knowledge on operational procedures and taught me numerous unexpected things about lantern hardware. There are alternative uses embedded in the images of skulls, turtles, and fish, and I cannot be the only lanternist to have noticed this.

> Ladies and gentleman, Hin the hurly hages of hignorance, there wasn't no such thing as a Phantastigrorium; it is a quite spick span new invention, never invented before. Here you will see, Ladies and Gentlemen, your friends and relations, dead and alive, present or absent, above or below. You'll excuse my descending into particulars. Never mind; we'll put you in spirits, I warrant ye, and keep ye in them too; proof spirits for the Ladies, and choice spirits for the Gentleman. I should have no objection to a drop of brandy myself… (*European Magazine* 1803: 186-188; Altick 1978: 218)

This causes some consternation among the audience. The lanternist's voice, coated in some obscure accent, issues from somewhere in the darkness. One child's face screws up in distress, and one of the elders protests that they had been promised an educational show. The little fat man has also noticed a growing pain in his midriff as the tin of his lantern rises to incandescent heat. Abandoning his show for the moment, he separates himself from the lantern and comes around the front of the screen, setting it on a little table. He takes a little time to compose himself and starts again.

Our lanternist begins as his little companion booklet begins. He introduces six classes of animal life (mammalia, birds, amphibia, fishes, insects, and worms, P. Carpenter 1823a: 14), and provides a spoken introduction to the Linnaean system of zoology. Starting with the mammalia class, he gives a summative outline of the primates:

> These have four fore teeth and two tusks, or canine teeth, in each jaw. They are subdivided into four genera or tribes, viz.
>
> 1. *Homo*—Man,
> 2. *Simia*—The Ape Tribe,
> 3. *Lemur*—The Macauco Tribe,
> 4. *Vespertillo*—The Bat Tribe. (1823a: 15)[23]

Continuing from the orangutang, the lanternist accompanies each animal with a lengthy description. Staying close to the booklet, he begins with a summation of the tribe:

> *Genus Simia,* or *The Ape Tribe.*
>
> This tribe greatly resembles man: they have a retentive memory, are imitative and full of gesticulation, chatter with their teeth and grin, and are the prey of leopards and serpents. To the South American Indians

[23] The book's errata corrects 'vespertillo' as 'vespertilio' (1823a: 170), but our lanternist does not realise.

> they serve as a common article of food, and are generally roasted over the fire.
>
> They are arranged under four divisions— [etc.] (1823a: 15)

This is followed by descriptions for each animal:

> Simia Statyrus—*chesnut Oran-Otan*. This animal very much resembles the human species, and in its native woods attains the same height. It is of a ferocious disposition, and possesses great strength […]
>
> Simia Lar—*Long-armed Ape.* There is a black species, of which the white is supposed to be a variety, differing only in colour. It is a native of India, and grows to a height of four feet or more. Notwithstanding the deformity of its figure, it is of a more tractable and gentle nature than most of its tribe, and has even been celebrated for the decorum and modesty of its behaviour. […]
>
> Simia Mormon—*Variegated Baboon*. This animal, in an upright position, is about five feet high, of a fierce disposition, and extremely muscular and strong. It is a native of the hotter parts of Africa. (1823a: 16)

The commentary is somewhat over the heads of the children, but they are delighted with the fine portraits. While discussing the long-armed ape, the little man stands in profile, crooks one arm, and lets the other dangle, in parody of the enormous projected figure. This provokes much laughter, and a barbed joke from a workmate.

Our lanternist shuffles through his box of slides, describing in turn the monkeys and lemurs and bats and six-banded armadillos. This takes some time. Observing the restlessness of his audience, he speeds up, abridging his descriptions to a few sentences. He jumps to a slider illustrating the wild cats (fig. 19):

> Lion—The King of the Wild Beasts—He is found in the Burning deserts of Africa. He is easily tamed & Never Savage towards those who use him kindly.
>
> Tiger—The most beautiful and mischievous of all Animals—It is furious without provocation & cruel without necessity.
>
> Leopard—is next to the Tiger in size fierceness & beauty
> It is not streaked but spotted—Its shape & actions resembles a Cat (Toddle 1990 [1841]: 50)

Sensing the respect given to these ferocious beasts, and extremely self-satisfied with his delivery, our lanternist reverses the order and returns to the tiger, for further commentary:

> THE TIGER
>
> (*Felis Tigris,* Lin—*Le Tigre,* Buff.)
>
> Is the most rapacious and destructive of all carnivorous animals. Fierce without provocation, and cruel without necessity, its thirst for blood is insatiable: though gutted with slaughter, it continues its carnage, nor ever gives up so long as a single object remains in its sight: flocks and herds fall indiscriminate victims to its fury: it fears neither the sight nor the opposition of man, whom it frequently makes its prey; and it is even said to prefer human flesh to that of any other animal. (Bewick 1980 [1790]: 206)

Growing in confidence, he is now deviating far from the zoology companion. He picks up the lantern and gives out a sheepish roar, to accompany his fearsome tiger. He applies a shivering motion to the image by giving the lantern a shake. He attempts also to make a figure 'lie on the floor, and rise up to a sitting position', as his booklet had suggested (1995 [1823]: 131), but quickly gives this up as futile. He runs through further slides, still more quickly than before, focusing only on the sensational facts he has learned. He tells of bloodthirsty ferrets suckling at the necks of infants. He is finding his inner showman. Recalling a dubious story he once heard, he throws a rhinoceros (fig. 20) onto the fabric screen:

> The rhinoceros is there, a fine fellow with rare thick skin, and a strong horn on his nose. They tell me that an enraged rhinoceros will sometimes run his horn in the belly of an elephant and lift him from the ground. What do you think of that?
>
> Wonderful times these we live in! […] Wonderful times, I say, these are, or you could not see a show like this under half a crown. (*Sergeant Bell* 1839: 117)

Shifting to the next image:

> O I did not mention the great Indian Elephant, noble animal! moves like mountain, and bathes in the big pond like a whale. […] Sagacious creature, wonderfully made! with his trunk he can pick up a pepper-corn or tear up a tree by the roots. (1839: 118)

Now improvising a story:

> Perhaps you have heard of the elephant and the tailor. The tailor pricked the elephant's trunk with his needle, foolish thing! ill natured thing! cruel thing! better have minded his work, a great deal. The elephant did not forget it, he filled his trunk with muddy water, and when he came by the tailor's window he spirted it all in his face. Served him quite right. Ought to have known better. (1839: 118)

This little routine earns great laughter and some small applause. Quickly he moves through the remaining slides, skipping the final few mammals, straight onto the birds and amphibia (purchased at extra cost):

> Besides these there are wolves, tortoises, otters, porcupines, armadillos, crocodiles, and the Brahma bull; condors, eagles, vultures, hawks, falcons, horned owls, birds of paradise. But I cannot tell you the names of half of them. (1839: 114)

He has not yet finished reading the book.

For his concluding slide, the stout little lanternist selects a fine green turtle (fig. 14). He tells of the tortoises, their slowness, and diet, and tenacity of life. He tells of the turtle's home in the West-Indian seas and its handsome size and strength. He lifts his lantern slowly into the air, making the turtle rise rise with it and, twisting the lantern between his hands, sends the creature off in a graceful arc around the walls of the room, rising upwards and drifting over the ornate ceiling. The lanternist shuts his eyes and sways happily as the translucent turtle passes over the faces of the audience.



Figure 18. Subjects in Natural History, 1836-1860. Phillip Roberts collection.
Mammalia: Human Skull—Oran-Otan—Long-armed Ape—Variegated Baboon, by Carpenter & Westley.



Figure 19. Subjects in Natural History, 1821-1836, Museo Nazionale del Cinema, Ref: M04311/003.
Mammalia: Lion—Lioness and Cubs—Tiger—Leopard, by Philip Carpenter.



Figure 20. Subjects in Natural History, 1836-1860. Museo Nazionale del Cinema, Ref: M04611.
Mammalia: Six-banded Armadillo—Rhinoceros—Elephant—Female Elephant and Young, by Carpenter & Westley.

IX. A Domestic Media Revolution

Our fabricated lantern show presents a number of possible (and inexact) approaches to domestic lantern performance. Because all lantern shows were ephemeral, it is not possible to properly understand what took place in the drawing rooms of amateur lanternists. But we can understand the broader field of lantern culture, as shown by its retail context, surviving objects, literary depictions, and discursive footprints. The users of the Phantasmagoria Lantern lived in an enveloping culture of signals. They may have read literature that invoked the lantern to describe other, lesser known, phenomena. They may have read stories about lantern shows, bought instructive companions, or seen performances in the public sphere. Many would have read Bewick's wildly popular *History of Quadrupeds*, or had access to other zoological texts. They would have explored the possibilities of the slides and equipment and developed approaches to lantern performance through experimentation. All of these external cultural conditions intersected to produce thousands of unrecorded domestic performances. Lanterns had existed for a century and a half, but the Phantasmagoria Lantern newly mobilised these different commercial and discursive frameworks to make possible a new kind of amateur domestic lantern consumption.

The Phantasmagoria Lantern owed its success to the way that it effectively straddled different prevailing discourses, attaining a moral worthiness that could offset its appeal to gawping wonderment. Carpenter collected the lantern and slides into a tidy commercial package and presented it as a simple instrument for everyday use. It easily slotted into prevailing cultures of fancy retail, novelty consumption, practical education, and spectacular entertainment.

Its success brought the lantern into the domestic sphere and increased its visibility. It decimated existing working-class exhibition by stripping wonder from the Galantee Shows. No longer able to exploit the curiousness of their instruments, or to sufficiently alter their routines, the itinerants struggled to compete. More illustrious showpeople emerged, with deeper pockets, and respectable content. Educators and performers with the latest equipment filled town halls and mechanics societies, presenting on various enlightening and virtuous topics. Amateurs followed suit. Everyone aped the old Galantee styles for laughs.

And so the lantern trade arrived. Not all at once, but in little pieces, as lanterns enjoyed wider circulation and increased in fame and popularity; as they proved their intellectual and moral worth. Other instrument makers produced the new lanterns and sold them as packaged commodities. Some, like Carpenter & Westley, and Newton &

Co., came to specialise in popular instruments and media technologies. There was money to be made with the lantern. Carpenter was one of the first to effectively demonstrate this.

Chapter 3.

Charles Blunt

I. Retail Practices in Context

Carpenter's perceived influence was already established among nineteenth-century observers. He was considered a significant innovator by Harrison (1887, 1888) and Timmins. The latter claims that he 'commenced business in Birmingham in a more systematic manner than had been known before' (1967c [1866]: 534). His influence is less pronounced in early twentieth century scholarship, but he later became a regularly-cited innovator among lantern and media scholars. Hecht says that Carpenter found 'solutions to problems which had been dormant for years' (1993: 77).

The newly commercialised lanterns added fuel to Carpenter's legacy. He capitalised on broader attitudes to science and entertainment and captured the market for fancy novelty items. The Phantasmagoria Lantern, with its distinctive wonky chimney, was the lantern that a generation of showpeople first used. It was the first time that most people could see and interact with projected images. It became a symbol for a new mode of shared public vision. One of Carpenter's nephews raised the lantern as a defining achievement of its maker:

> Mr Philip Carpenter was a man of scientific attainments, and rendered great service to education by his improvement in the phantasmagoria, which, as the magic lantern, had previously been a mere toy. (R.L. Carpenter 1878: 49)

This is all true. This lantern was crucial for the popularisation of consumer media. But focussing on Carpenter can lead to the marginalisation of other important media practitioners. Other instrument makers were selling lanterns and other media devices seized the popular imagination. If we look at the surrounding retail context, we find a vibrant network of enterprising shopkeepers and strange new products. Many innovative features of the Phantasmagoria Lantern were fairly common among

commercial instrument makers and novelty retailers. In this chapter I will present a wider commercial landscape and show that Carpenter was not the lonely, pioneering genius that he would have us believe.

I will introduce a lesser-known instrument maker called Charles Blunt, who had earlier attempted many similar commercial innovations, with far less success. There were numerous people who preempted Carpenter's practices, but who we fail to credit. Priority is a poor criteria for assessing historical significance. Instead, I propose a more nuanced understanding of shared practices across sectors and disciplines. All retailers engaged in intellectual theft. Blunt's case confirms how many of the Phantasmagoria Lantern's core innovations were present in earlier business models and help to suggest alternative explanations for its success and influence.

II. Charles Blunt's Improved and Rational Magic Lantern

Charles F. Blunt was an optician of Tavistock Street in Covent Garden. He was the eldest son of Thomas Blunt, of Nairne & Blunt, a prestigious optical instrument business operating at the end of the eighteenth century (Stevenson 2016a). Charles began working with his father at 22 Cornhill (as Blunt & Son) around 1801, but had established his own business on Tavistock Street by 1812 (Blunt 1814b). In advertisements and trade directories he is most commonly identified as C. Blunt and listed as an optical and mathematical instrument maker. He made glasses and drawing implements, was an accomplished draughtsman, and wrote a number of descriptive treatises.

In an advertisement of January 1814, he presented his Improved Rational Magic Lantern:

> BLUNT,
>
> *Optical Instrument Maker*,
>
> 38, TAVISTOCK-STREET, COVENT-GARDEN,
>
> RESPECTFULLY announces a completely NEW JUVENILE WINTER AMUSEMENT, by his
>
> IMPROVED RATIONAL MAGIC LANTERN
>
> By various improvements in this curious and delightful instrument, BLUNT has rendered it a powerful medium of INSTRUCTION, as well as AMUSEMENT; and his paintings are made in a very brilliant and accurate matter, from original drawings.

> PAINTINGS FOR THE MAGIC LANTERN arranged in regular sets, to illustrate the principles of the sciences, and exhibit their most interesting objects and appearances.
>
> The regular subjects already arranged and published are ASTRONOMY and NATURAL HISTORY. (1814a)

A second advert was published in April 1814:

> AN IMPROVED AND RATIONAL MAGIC LANTERN
>
> By various improvements in this curious and delightful instrument, and several new applications of its powers, C. Blunt has rendered it more extensively and rationally amusing, alike interesting to every age and class, capable of affording the most beautiful and instructive illustrations of scientific subjects, and the medium of very impressive practical lessons on any branch of moral and religious instruction. (1814c)

This was seven years before the Improved Phantasmagoria Lantern. Blunt's lantern is marketed in very similar terms to Carpenter's, using familiar language to highlight its educational benefits. Compare this with the 1822 *Liverpool Mercury* advert that claims the Phantasmagoria Lantern 'may provide a powerful auxiliary in the business of education' (Bywater 1822: 327). The additional note 'as well as amusement', given in the Blunt advert, recalls the duplicity of Carpenter's lantern discourse, swinging between educational and spectacular tendencies. Blunt presents the lantern as an educational instrument, but he still provides 'grotesque and droll paintings in great variety' (1814a), for those more interested in monstrous or farcical views.

Blunt adopts an identical approach in marketing towards domestic middle-class users. He appears to have already transitioned into the domestic instrument market by 1814, when he was selling a range of drawing instruments, opera glasses, pocket telescopes, perspective mirrors, and tinted glasses (Blunt 1814d). Where Blunt & Son had produced microscopes (Stevenson 2016a), Charles Blunt's own practice focussed on middle-class leisure pursuits. He advertised 'ladies' mathematical drawing instruments', consisting of 'a new and more commodious arrangement of compasses, scales, &c. for a lady's drawing table' (1814d). Consumers could also purchase *An Essay on Mechanical Drawing* (Blunt 1811), geometric models of regular shapes, and a camera obscura (1814d). He sold glasses, like other opticians, to a general market (1816: 1), and arranged packages of optical and mathematical instruments for artists, naval officers, and scientific travellers (1816: 2). Instrument makers had long served the dilettante market, but for Blunt to publish so many adverts exclusively targeting the

middle-class amateur consumer was unusual and provides a strong indication of the changing trade in the 1810s.

Blunt's lantern was accompanied by the same slide sets as Carpenter later sold in the 1820s. A more complete description is presented in an 1816 advertising bill:

> *An Improved Magic Lantern*,
>
> WITH COMPLETELY NEW AND SUPERIOR PAINTINGS.
>
> The following list of new designs for the paintings of the Magic Lantern is respectfully recommended to the attention of Parents, conductors of Public Schools and all concerned or interested in the instruction of young persons as enabling them to dispense valuable instruction as well as high rational amusement through the attractive medium of a popular and delightful instrument.
>
> 1—A selection of the most interesting and striking Phenomena of the Heavens; the appearances of the Sun, Moon, and Planets as viewed through Herschell's Telescope; highly magnified views of the most curious parts of the Moon's surface to promote the enquiry into its natural construction and the probability of its being inhabited; the figures of the most remarkable constellations, appearances of comets and meteors, and various other picturesque objects of the same nature; composing altogether, with the improved Magic Lantern, &c. the whole machinery and scenery of a FAMILIAR LECTURE on the most popular and pleasing parts of ASTRONOMY, and with a full descriptive volume, affording A COMPLETE EIDOURANION on a small scale, for the amusement and instruction of a family circle, or the higher classes of schools, in 6 to 24 slides.
>
> 2—Picturesque figures of the whole Animal Creation, accurately drawn and coloured, and scientifically classed in 6, 12, 24, or 36 slides.
>
> 3—A miscellaneous selection of rare, curious, and interesting objects of Natural History, as Birds, Quadrupeds, Reptiles, Botanical subjects, Portraits of Savage Nations, &c. &c. from the best voyages and travels, in 12, 18, or 24 slides.
>
> 4—Microscopic views of curious insects and animalculæ, as they are seen through the most powerful microscopes in 6, 12, 18 or 24 slides.
>
> With these slides the Magic Lantern affords the interesting exhibition of the Solar microscope.

> 5—Views of extraordinary remains of antiquity, buildings, &c.—stupendous and remarkable scenes and views in nature; singular costumes of foreign nations, &c in any number of slides from 12 to 300.
>
> 6—A great variety of miscellaneous amusing subjects.
>
> 7—A great variety of horrible and terrific figures for the exhibition of the Phantasmagorie. (1816: 3)

With the exception of the 'horrible and terrific figures', all subjects are repeated in Carpenter's catalogues. Like Carpenter's, Blunt's natural history slides were 'most accurately drawn and coloured, and scientifically classed according to Linnæus' (1814). It is unlikely that Carpenter copied these slides exactly, given the differences in slide numbers, but his *Elements of Zoology* sliders, also following the Linnaean classifications, could certainly have been intended as an analogue of this earlier set.

This does not mean that Carpenter copied Blunt. Many innovative aspects of the Phantasmagoria Lantern are not evident here. Blunt's slides are described as 'drawn and coloured', not printed in the fashion of the Copper-Plate Sliders, and there is no mention of Carpenter's compound lens arrangement. There are no surviving examples of Blunt's lantern or slide output; it is not even certain if Blunt manufactured the lanterns himself. What is important is that Blunt predates Carpenter's re-articulation of the lantern as an educational instrument for the domestic market.

This is not a question of priority. These advertisements prove that Carpenter's marketing discourse was already expressed by other instrument makers. His practices existed as a common mode of media exploitation that was developing over these decades. They were demonstrably used by many practitioners and any attempt to reduce them to priority for one person or another misses the point. The lantern was established as a domestic media instrument because of a whole range of approaches and discursive realignments. These practices were the oxygen of media transformation. They supported an abundance of lantern retailers.

III. Common Approaches

It is not clear what kind of lantern Blunt sold. There is no illustration or complete description in any of the advertisements. There is a trade card for his father's business from around 1800 that features a black lantern tucked away on a shelf at the back of a shop (BM 105.14; fig. 21). This has a slight resemblance to the Phantasmagoria

Lanterns, but it is difficult to be sure, given the simplicity of the engraving.[24] Carpenter did not invent the Phantasmagoria Lantern format. This is clear, given =earlier bullseye lanterns with the stylistic appearance of the Phantasmagoria Lanterns.[25] This raises the spectre of a field of common practices enveloping all lantern makers. The pre-existence of the style used by Carpenter, present in earlier models, but without other features, suggests a floating set of tendencies that can be variously appropriated and embedded in different lanterns at different times. Carpenter was not uniquely innovative. His case suggests a constellation of common approaches in dialogue with other manufacturers and retailers.

We know that Carpenter's zoology sliders are traceable to engravings by Buego and Bewick. Similarly. His astronomy diagrams exactly match a set of educational picture cards (fig. 22), first published by Louis-Michel Pâris in France around 1790 and adapted for the English market by John Wallis soon after. The same astronomical designs are repeated in the output of numerous slide makers over subsequent decades (fig. 23). Given further repetitions in a later astronomy textbook by Blunt (1840), it is probable that his astronomical slides resembled these images.

There are identical astronomy slides made by Dollond, Frederick Cox, W. & S. Jones, Newton & Co., and Andreas Krüss of Hamburg. The same designs were later used as the basis for Carpenter & Westley's mechanical astronomy slides, which animated the diagrams using rackwork and lever mechanisms. They are repeated again in Blunt's *The Beauty of the Heavens,* illustrated with coloured plates. The book claims that these were based on 'original drawings, paintings and observatory studies by Charles F. Blunt' (1840: 1), but many seem to be exact replicas of earlier images.[26] Versions of the natural history slides similarly repeat in the output of numerous other manufacturers (figs 24 and 25). In both cases, this does not so much prove direct lineage as repetition of common modes for lantern figures. There was a set of shared image practices that all manufacturers were referring to.

Horace Wellbeloved credited Blunt with bringing astronomical diagrams to the lantern:

---

[24] I cannot decide if the lantern is square, and therefore quite like a Phantasmagoria Lantern (but without the folded conical chimney), or cylindrical, like a fatter 'London lantern' (Rossell 2003, 2009).

[25] In the Richard Balzer collection and the Museo Nazionale del Cinema (Ceram 1965: 35).

[26] It is possible that the images were drawn by Blunt. His treatise on mechanical drawing shows that he was an accomplished draughtsman (1811). If these were original drawings then they owe much to pictorial conventions on illustrating the astronomical bodies. This may explain the repetition of images across slide sets and again points towards shared practices and approaches.

> About the year 1800 […] the figures of the constellations and the telescopic views of the planets were first painted on glass, for exhibition, as phantasma in the magic lantern. This originated, as well in the idea as the practical execution, with Mr. Charles Blunt, an optician and artist; and it has since been successfully introduced in most of our public schools and establishments. (1826: 2)

This is an attempt to frame the development of astronomical entertainment in terms of innovation and priority. But it is a needless attribution. Blunt only appropriated an existing format for a new medium. I am reluctant to credit him with priority for the astronomical diagrams, even if only with respect to lantern slides, given the weight of incorrect priority claims for Carpenter by Harrison, Timmins, Barnes, and others. Wellbeloved complains of 'the rude imitations of [Blunt's] paintings, which have, in too many instances, seemed intended rather to caricature than to illustrate astronomy' (1826: 2), so there is reason to think that the format was widespread. A small shopkeeper, interviewed by Henry Mayhew, articulates this issue quite well:

> About thirty years ago [around 1820] the diagrams for astronomy were introduced. These were made to show the eclipses of the sun and moon, the different constellations, the planets with their satellites, the phases of the moon, the rotundity of the earth, and the comets with their good long tails. What a tail 1811 had! and similar things that way. This I consider an important step in the improvement of my art. Next, moving diagrams were introduced. I really forget, or never knew, who first introduced these improvements. (1973 [1850]: 357)

The shopkeeper has a clear grasp of a typical astronomical performance, going on to describe the different moving diagrams in precise detail. He has no knowledge of the origin of these designs. Indeed, it does not much matter to him, so long as he maintains a mechanical understanding of the format. It is unnecessary to attribute priority to one figure or another, because there are always others hidden away in the archives. Carpenter is often taken as originator of many slide designs, but Blunt was selling similar versions seven years earlier. His too were likely descended from elsewhere: Buego's engravings, Pâris's astronomy cards, or other visual precursors. There are probably earlier versions of each.

These designs were not the only practices that Carpenter owed to the wider trade. Even the name of his lantern was borrowed from the Phantasmagoria. Carpenter adopted the name, but not the format, of an earlier mode of exhibition (which tended to use a movable Fantascope as its primary projector). As John Barnes says, 'the name

“Phantasmagoria” which Carpenter gave to his magic lantern was really a misnomer, for the word signifies a mode of projection rather than a type of lantern’ (1997: 20). Some Phantasmagoria Lanterns had belts or handles, so it was possible to use one as a supplementary lantern in a Phantasmagoria performance, moving it around behind a screen to produce roving projections, but it was not suitable to give performances unaccompanied. This means, contrary to Carpenter’s sales pitch, that the lantern was not ‘particularly well adapted to the exhibition of the Phantasmagoria’ (1823a: 4). It was better suited to smaller domestic Phantasmagoria shows. Yet despite this, as Beattie argues, Carpenter placed the Phantasmagoria Lantern in a rhetorical context that made it easily recognisable (2013: 7). He appropriated older forms of exhibition and reinterpreted them for his own purposes.

The prefix ‘improved’ was commonly appended to microscopes and other optical instruments, to suggest improvements over earlier versions (often without adding improvements). Carpenter himself stocked both Improved and *Most* Improved Compound Microscopes (1834: 8-9). Before adopting the Phantasmagoria monicker, he advertised his lanterns as ‘Carpenter’s New Improved Magic Lanterns’ (LB MS 4834/844). Blunt’s advertisements show that Carpenter was not the first to have framed lanterns in this language (1816: 3). Many of Carpenter’s business practices were common to the wider trade.

Blunt confirms that Carpenter has no priority for the commercial realignment of the lantern. His case insists that we abandon the great innovation model of media history in favour of one that considers a more complex field of practices encompassing all practitioners and differently embedded in local circumstances and infrastructures. The most popular slides can be traced to other examples of visual culture. Blunt’s grotesque figures were echoes of the Phantasmagoria. The natural history sliders recalled Bewick. Continuous landscape views and astronomical slides miniaturised the moving panoramas (Huhtamo 2013: 46-53) and the mechanical contrivances of Adam Walker’s Eidouranion (Altick 1978: 364-366). Some lanterns came with projection microscope attachments, so as to bridge the gap between projected entertainment and popular microscopy. Later in the 1820s, Capenter constructed the Microcosm—a public attraction of projected microscopic views—in his Regent Street shop (Roberts 2017). The continuum of visual entertainment carried lantern culture into diverse realms.

Blunt filed for bankruptcy in 1818 (*Literary Panorama* 1818: 1043), tripping over the doorstep of the new media age. He did not leave anything like Carpenter’s footprint, but he remains a useful indicator of a cooperative of shared practices across manufacturers and retailers.



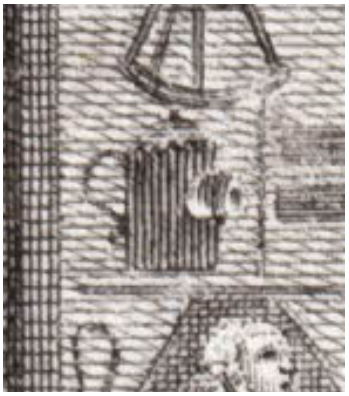

Figure 21.
Trade card for Thomas Blunt, engraved by W. Thomas after a drawing by I.C. Barrow, 1794-1800.
British Museum, Ref: 105.14 [with enlargement of magic lantern].

Figure 22.
The Elements of Astronomy and Geography Explained, 1795.
National Maritime Museum, Ref: AST0043.
Educational picture cards, coloured engravings by John Wallis, after Louis-Michel Pâris.



Slides on following page:

Eclipse of the Sun by Carpenter & Westley (MNC M03066/006), unknown maker (PR), and Charles Blunt (1840: pl. 51); Diurnal motion of the Earth, by Carpenter & Westley (NSMM 1955-66/5), Dollond (MAS H10273/1), and unknown maker (NSMM 1990-5036/15086); Rotundity of the Earth, by Carpenter & Westley (MNC M04009), W. & S. Jones (BDM 64091/1), and Blunt (1840: pl. 2); Signs of the Zodiac, by Carpenter and Westley (MNC M03066/004), Frederick Cox (MNC M04006/001), and unknown maker (NSMM 1990-5036/13256); Comparative Sizes of the Sun and Planets, by Carpenter & Westley (MNC M03072/012), Andreas Krüss (NSMM 1990-5036/31238), and Blunt (1840: pl. 22).

Figure 23. Astronomical diagrams compared across slide producers, and with Blunt's illustrations.



Figure 24. Natural history subjects compared across slide producers.



Hippopotamus by Philip Carpenter (MNC M04311/005) and unknown maker (PR); Opossum by Carpenter & Westley (BDM 64539/8) and Newton & Co. (NSMM 1990-5036/15041); Great Ant Eater by Philip Carpenter (MNC M03064/002) and Andrew Pritchard (NSMM 1990-5036/13193); Elephant by Newton & Co. (NSMM 1990-5036/15050) and Griffin (NSMM 1990-5036/15112); Lion by Griffin (NSMM 1990-5036/15116), Robert Bancks (NSMM 1951-309/1), Philip Carpenter (MNC M04311/003), and unknown maker (PR).



Figure 25. Slipping slides compared across slide producers.
Moving-eye lions by Philip Carpenter (Lester Smith), unknown maker (NSMM 1990-5036/11660), and Harris & Co. (NSMM 1990-5036/11431).

IV. Historical Visibility

Carpenter did not invent the copper-plate process, nor did he pioneer the mass production of lantern slides. He did not invent the solar microscope, or dissolving views, and he was not unique in projecting educational discourse. The Improved Phantasmagoria Lantern was a crystallisation of various pre-existing tendencies. It was not uniquely transformative.

For marketing reasons, Carpenter self-consciously built the idea of himself as a great innovator. He published a series of companions to his lanterns, slides, and microscopes (1823a, 1823b, 1825, 1826). These provide interpretation for the slides and instruments, but also frame him in a context of manufacturing innovation. In his description of the Phantasmagoria Lantern he is at pains to establish the differences between his compound lantern and earlier single-lens models, and to communicate the advantages of his transfer-printed slides over hand-painted versions (1995 [1823]: 124–131). Analysis of surviving lanterns supports Carpenter's claims with regards to his lens-arrangement, which was more complex, and presented a clearer image, than the single-lens bullseye lanterns. There is reason to cautiously accept Carpenter's priority with regards to compound lens arrangements, as there are no obvious earlier examples and because his experience as a microscope maker may have suggested this arrangement in lanterns, but it remains possible (and likely) that he borrowed it from elsewhere, or that it emerged organically in multiple workshops around 1820.

His claims to 'inventing' the Copper-Plate Sliders and pioneering mass production are more dubious. Hecht says that Carpenter's transfer process was preceded by ceramics manufacturers Sadler and Green, who used it to produce single-colour designs from 1756 (fig. 26), and John Brooks, who was printing onto enamelled copper-ware from 1751 (1980: 3).[27] Carpenter was the first to apply this transfer process to glass slide production, but inspection of the surviving slides shows that the work added to the printed outlines by artists was substantial (fig. 27). The image was not just coloured, it covered the entire outline and was embellished with details and backgrounds. The slides also required hand assembly, setting glass into frames with metal fixings. Mass production is a poor description of this manufacturing process. Copper-plate printing could not have accelerated production output substantially and it did not have a transformative effect on slide production. Production did not expand to

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[27] Hecht says 1753, but Brooks had applied for patent two years earlier. Hecht also refers to him as John Brooks of London, because he ran a manufactory at Battersea, but he was more closely related to the Birmingham trades, where he had trained (Watney and Charleston 1966: 61; Fogarty 2016: 115).

industrial levels until the arrival of lithographic and photographic slides (Hecht 1980; Frutos 2013).

Carpenter's description of the benefits of the Copper-Plate Sliders was a marketing exercise to establish distinctions between his output and the rest of the market. Having outlines printed allowed Carpenter to standardise slide subjects (although the painted images are often notably different), which had advantages for selling identifiable products. The slides were a retail innovation, but not a manufacturing one.



Figure 26.
Earthenware tile, 1758-1761. V&A, Ref: C.139-1981.
With transfer-printed decoration from a copper engraving, by Sadler and Green, 1758–1761.



Figure 27.
Details from Kings and Queens of England sliders, 1821-1836. Phillip Roberts collection.
Edward I, Edward II, and Richard III, by Philip Carpenter.
Printed from a copper engraving and then hand painted.
Damage to the paintwork reveals the printed outlines.

IV. Pentagraphic Portraits, or, the First Mechanically-Produced Lantern Slides

I reject conventional approaches to media technology that focus on priority and invention in favour of a new conceptualisation of media as a field of shared practices. From this perspective, both Carpenter and Blunt suggest indicative frameworks that stand for larger fields of practice. In London, this kind of collective practice had previously been formalised in the guild system, which protected knowledge and techniques, and ensured continuity of practice through indentured apprenticeship. Practices were also shared through informal relationships, while new ideas could be suggested by market pressures commonly applied to everyone. There is no reason to think that Carpenter copied Blunt's re-articulation of the lantern as an educational instrument. This could have been suggested to both makers independently by the changing market. Evolving practices in the instrument trade were driven by theft, sharing, market pressures, and structural changes (McConnell 2016).

But innovations did happen; through applications of existing methods to new paradigms, clever exploitation of structural conditions, or a departure on an entirely new trajectory. As Wiebe Bijker shows, invention is based on existing technologies driven by extrinsic conditions towards new technical systems (1995, 2012 [1987]). We have to determine how technological creativity intersected with structural conditions to become usefully embedded in a social reality. Was an innovation rejected as useless by its adopted context? Was it absorbed by an existing market? Did it have a transformative impact on its situation? Priority is less important than the implications of innovation.

Carpenter's application of the copper-plate process to lantern slides, despite all his claims, did not have a transformative effect on slide production. His output remained wedded to existing techniques and networks. The breakthrough in automatic slide production had to wait until photographic and lithographic transfer techniques were applied in the 1860s. These practices changed their own context.

Seven years before the Copper-Plate Sliders, Charles Blunt pioneered a different technique for automatic slide production. This is presented in an 1814 advertisement:

> The following subjects are,
>
> A COMPLETELY NEW APPLICATION OF THE MAGIC LANTERN

> The frames, which are handsome, are so contrived, that they may be hung against a window as transparent paintings, or about a room, as miniatures.
>
> Black Profile Likenesses, faithfully transferred to glass, by a pentagraphic process, to exhibit in the Magic lantern, 5s. each plain—in the new frames, 7s. each.
>
> Highly finished Landscape Views of Gentlemen's Country Seats, 7s each.
>
> Accurate and faithful copies of Portraits of Horses, Dogs, &c. 7s to One Guinea.
>
> A continual succession of Portraits of the most interesting Characters of the Times.
>
> Portraits of the Allied Sovereigns, and their most distinguished Generals, 7s. each.—Portrait of Mr. KEAN, in the Characters of Hamlet and Richard III. 7s. each. (1814c)

The advert is not especially clear, but expressions like 'faithful copies' and 'likenesses transferred to glass' point to a copying technique. This was achieved using a pentagraphic process—that is, drawn using a pantograph.[28] A pantograph is a seventeenth-century mechanical apparatus used to copy drawings (Bud and Warner 1998: 435-437; fig. 28). It fixes a stylus to four wooden or brass rods, arranged to form a parallelogram, with a second stylus fixed in the centre of the instrument and a weight at the end of the furthest rod. The first stylus is placed on a map or picture to trace over its outline, which is then repeated exactly by the second stylus. In this way, enlarged or reduced copies can be mechanically produced.

Blunt used the device to trace profile silhouettes of people, dogs, and horses onto lantern slides. Silhouettes were easily made and very popular in the early nineteenth century. Blunt's application transferred profile likenesses to lantern slides and allowed lanternists to include real people in their projections. This is an interesting use of existing technologies to produce bespoke images for domestic lantern shows. In a culture unused to viewing images of the self, one can imagine the impact of

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[28] 'Pentagraphic' is a rarely-used variant spelling of pantographic (meaning: produced by means of a pantograph). The variant 'pentograph' is used for John Dunn's version of the instrument (Bud and Warner 1998: 436), while 'pentagraphic' features in Lawrence Stern's *Tristram Shandy* ('the honourable devices which the Pentagraphic Brethren of the brush have shewn in taking copies', 2004 [1760]: 54).

projecting an enlarged profile of a friend, directly (if circuitously, through several hand-mechanical stages) copied from their own features.

This was probably the first application of mechanical reproduction techniques to lantern slide manufacture. It did not allow automatic reproduction from life, as photography later would, or multiple reproductions of the same image, as with lithography, or even the printing of many images from a single matrix, as Carpenter's copper-plate transfers achieved. Blunt's pentagraphic process made one-off copies derived from a single tracing of a source image. Strictly speaking, the copy was indexical of the hand movements made while tracing, not of the original source. Further copies could be made, but they were each based on a separate and unique series of mechanical movements that may minutely differ depending on the accuracy of the copyist. The pantograph was an imperfect copying tool because it relied on the skill of the user in manipulating a stylus at a mechanical remove, subject to the wobbles and roughness of the moving rods. Pantographs struggled to produce smooth curves and any mistakes made in tracing a (quite complicated) silhouette profile would certainly have been amplified in an enlarged lantern projection.

But this does not mean that Blunt's innovation was foolish or, in the context of the times, unusual. Pantographs had been used to reduce silhouette portraits since 1775 (BP 1100; BP 1183; Hecht 1993: 48-49). In this age of pre-photographic media, the ability to mechanically copy images from life would have been quite magical. Blunt's transfer process was the latest of many automatic (or semi-automatic) image-production apparatuses that included the camera obscura (Hammond 1981), camera lucida (Hammond 1987), and Kircher's 'back projection machine' (Hecht 1993: 17, 441; *From Today Painting is Dead* 1972).

Eight years before Blunt, Charles Schmalcalder patented his 'Delineator', a twelve-foot tracing apparatus that produced a profile silhouette of a seated subject (BP 3000; Schmalcalder 1807; J. Smith 1993: 6; Hawkins 1807; fig. 29). The problem with such contrived tracing apparatuses is that minor imperfections are amplified (by a magic lantern or a twelve-foot metal rod). It is not clear if Schmalcalder ever put such a cumbersome instrument into commercial use, but there is evidence of other tracing

machines in operation.[29] The Media Museum has a machine-produced silhouette portrait of a young woman, made in Halifax around 1810 by a machine (according to text on the reverse) called 'Prosopographus, the Automaton Artist', capable of producing a likeness in a single minute (fig. 30). Similarly, a surviving trade advertisement shows that an itinerant artist in Birmingham offered silhouette likenesses 'by a machine of unerring principles' (BMT 1996F126; fig. 31). Elsewhere, Jones of Wells Street, exhibitor of Phantasmagorae and Allegorical Fireworks, sold reflecting mirrors 'for taking Likenesses in Profile or Full Face' (Jones 1807). The appeal of mechanical or optical reproduction was not in an image's accuracy, but in the magic of automatic reproduction. The popular instruments of the era situated mechanical ingenuity or educational content within an implicit context of wonderment.

Blunt's process left no lasting impression on slide manufacture. There is no evidence of others applying mechanical copying techniques to slide production. Even Blunt seems to have abandoned this 'completely new application of the magic lantern' after April 1814. This may have been because the likenesses were of poor quality, or because customers were insufficiently excited by bespoke profiles to commission Blunt to make them. 7s was also very expensive for a lantern slide. Comparatively, Blunt sold miscellaneous amusing slides for 6s, 5s, or 3s each (1814c); Carpenter's Copper-Plate Sliders cost 4s 6d each in 1827 (earliest available prices, Carpenter 1827: 26). Whatever the reason, Blunt's mechanical slide-production technique was a practical dead end.

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[29] The first silhouette machine, called the Physionotrace, was built by Gilles-Louis Chrétien in 1873 (Walton 2018). This machine engraved the subject's profile onto a metal plate, so that multiple copies could be made. It is not clear how it worked. A later history reports: 'Every town, and almost every village, was periodically visited by the caravan-housed professor, who for sixpence would supply a likeness by the royal patent machine and throw in a frame. For an increased fee he would cut papa, mamma, and the whole tribute of little ones, whose likenesses would be stuck on to a sheet of white cardboard in a mathematically straight row, the sizes gradually diminishing until the vanishing point was reached by baby, or perhaps a little dog. Cats when cut had a knack of coming out uncommonly like goats or donkeys, and for this reason were tabooed in family groups' (Tuer 1890: 749).



Figure 28.
Pantograph by Charles Blunt, 1814-1818.
David M. Riches collection.

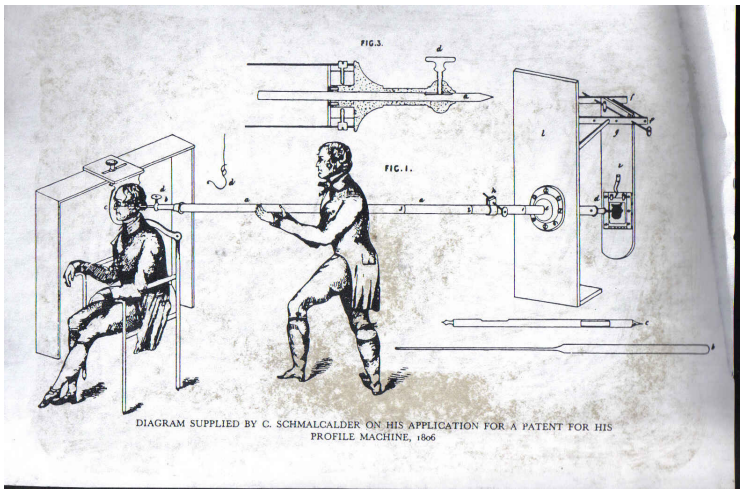

Figure 29.
Patent illustration for Schmalcalder's tracing apparatus, 1806. British Patent Archive,
Ref: BP 3000.



Figure 30.
Profile likeness of a woman, mechanically produced by Prosopographus, the Automaton Artist, c.1810
National Science and Media Museum,
Ref: 1990-5036/6971.

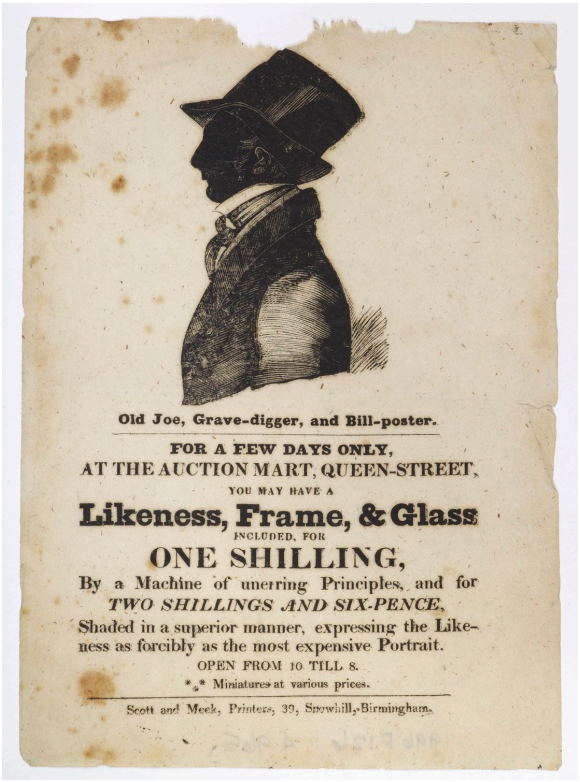

Figure 31.
Advertisement for miniature likenesses in profile, mechanically drawn and then hand-shaded, 1790-1830.
Birmingham Museums Trust,
Ref: 1996F126.

V. Failed Inventions

Rossell raised the spectre of failed inventions in his research on early cinema machines (2014, 1998), challenging a persisting teleological conception of projection technology in favour of a model embedded in social history. According to Rossell, common approaches to early cinema technology miss how technical innovations are framed and challenged by social conditions. He explains:

> This approach treats technology as a self-contained 'black box' whose contents and behaviour are assumed to be common knowledge: a clock keeps time, a movie projector throws a picture onto a screen. By limiting their enquiries to the abstract discussion of the mechanisms within this black box of technology, historians not only divorce technological evolution from the tumult and conflicts of the real world, assuming that there is only one single best solution to a single problem—a solution that will eventually dominate the marketplace and become standard practice through its inevitable inner technical superiority; but they also tend to ignore any exploration of alternative, often failed, technological solutions, which are considered only mistakes or faltering steps along the path to creating a successful artefact—a success defined retrospectively by arguing backwards from the matured practice of the industry under consideration. (2014: 306-307)

Following Rossell, it is easy to see why Carpenter is hailed as a key innovator. Carpenter is attractive for scholars working backwards from a later lantern industry circulating thousands of mass-produced lantern slides, and with Carpenter & Westley long-established among key retailers. But as I have shown, the problems with this perspective are manifold. Carpenter was not the originator of automatic slide production, and his transfer process did not influence later photographic and lithographic processes. Blunt got there first, but his pentagraphic process was impractical and quickly disappeared from advertisements. The matured lantern industry did not look very much like the trade known by Carpenter and Blunt. To get to its later state, it would yet have to pass through further technical, social, and organisational transformations.

Blunt advertised numerous unusual instruments and applications that were not replicated by other instrument makers. His pentagraphic slides are of interest because of later innovations in automatic slide production, but they were not uniquely imaginative in his output. Among his more absurd advertisements, we find 'Blunt's new

Megalascope', a ceiling orrery, a 'portable phantasmagoric lantern', the Polyphantasma, and an apparatus called 'The Peace'. It is difficult to imagine a market or, in some cases, even a plausible use for some of these instruments, but they show that Blunt was actively pursuing new instruments, and novel applications of old ones. These instruments should remind us that innovation is a poor indicator of historical significance. Most innovations failed.

Some examples from Blunt's advertisements:

The Megalascope:

> Blunt's new Megalascope, an instrument completely fit for the general purposes of a Pocket Telescope, and which, by an additional apparatus becomes a very powerful Microscope for examining large or small objects; it is particularly useful and interesting in botanical and other researches in natural history, as for examining flowers, plants, &c. without gathering them; insects, &c. without the trouble of catching them; Curious but noxious reptiles, without the necessity of approaching them, &c. &c. (1816: 2)

A ceiling orrery:

> Blunt's new orrery; consisting of a complete set of actual MODELS OF THE PLANETS, explaining their respective figures and peculiarities, their relative sizes, &c.
>
> These models may be used separately, to exhibit the circumstances of each planet (as the belts, spots, &c. of Jupiter, Mars, and Venus; the rings and belts of Saturn, the spots of the Sun, the phases of the Moon, and the phenomena of the seasons, and the alternation of day and night on the earth,) or may be suspended from the ceiling of a room, at their proper relative distances from the Sun, or they may be arranged on a lawn or a play-ground, and thus form a very correct and interesting orrery of vast and unusual dimensions.
>
> This arrangement produces a most interesting astronomical exhibition and exercise for young persons, and affords more satisfactory and correct ideas of the immensity of space, the distances, and other wonderful circumstances of the system of the universe, than any mechanical contrivance at present known. (1816: 2)

A Phantasmagoric Lantern:

> A small portable Phantasmagoric Lantern with suitable Paintings, the whole small enough for the pocket, and makes an excellent and very superior dark lantern. (1814a)

The Polyphantasma:

> The curious illusive exhibition, called POLYPHANTASMA, which *multiplies* the figure exhibited to any number of figures at pleasure, and produces many excellent and extraordinary optical effects. (1814a)

The Peace:

> A most elegant and economical mode of exhibiting Illuminated Transparencies, on occasions of PUBLIC REJOICINGS, by making the Screen of the Magic Lantern occupy the window. (1814d)

The most interesting among these instruments is Blunt's 'Phantasmagoric Lantern', which, in name, suggests something like the later Phantasmagoria Lanterns. The instrument is described as 'small enough for the pocket', and while miniature toy versions were made, they could not be used as an effective dark lantern. A dark lantern was not a magic lantern at all, but an illuminating lantern used to light the way at night. These lanterns typically had a circular opening covered with glass (later a bullseye lens), in the manner of a magic lantern, to direct a beam of light forwards like a modern torch (fig. 32). The tin body was cut with many small openings to allow airflow and light escape, but without producing a draught that would blow out the candle.

That the advert mentions suitable paintings indicates that this was a kind of miniature magic lantern / dark lantern hybrid. Binétruy has an unattributed lantern of this type in his collection (fig. 33), with a slide stage and bullseye lens in a longer tube, but otherwise resembling a bullseye dark lantern. This is, to my knowledge, the only surviving example. Small hand-lanterns of this type are present in various illustrations (Robinson 1993: 18, 37, 53), but they are rarely related to the older dark lanterns.

An 1815 compendium of ghost stories draws a curious connection by illustrating a dark lantern projecting a monstrous portrait before terrified onlookers (fig. 34). In text, the apparition is evoked only by the light of a dark lantern, illuminating the air for a moment:

> In the night, one of these unlucky boys got a dark lanthorn, which was a thing, at that time, the country-people did not understand; and with this he walked about the orchard, and two or three closes near the house,

> shewing the light in different directions. His comrades would then call all the old women about them to see it. Then, on a sudden, the light would seem to go out, as the boy closed up the lanthorn. Then he would run swiftly across the whole field, and shew his light again on the other side. Now he would be up in a tree, then in the road, then upon the middle of the heath; so that the country-people made no more question, but that the old lady walked with a candle in her hand, and that they saw the light of it; in a word, it passed for an apparition, and was generally conceived as such by the neighbourhood, till the knavery was discovered, the boys punished, and the townspeople laughed at for their credulity. (J. Taylor 1815: 93)

The boys do not use their lantern to project any pictures, but this does not stop the illustrator showing a visible image emerging from their dark lantern. A ghost, existing only in the minds of the observers, is shown as if projected from a magic lantern. The alignment of the two lanterns in the popular imagination was clear enough to suggest such a device as Blunt's Phantasmagoric Lantern.

Blunt did not consider the Phantasmagoric Lantern part of his greater magic lantern output (which occupies more space in his adverts), as he never mentions any similar applications for his magic lanterns. It disappears after only one mention in January 1814, leaving a puzzling addendum to his lantern practice. It is unclear if Blunt's appropriation of the term 'Phantasmagoric' suggests an early example of the later Phantasmagoria Lanterns, or if he independently borrowed it for a different kind of instrument. Blunt did not apply the term to his broader lantern output. We see from the description of 'The Peace' that he was familiar with back-projection, but he never suggested any application of this technique for producing phantasmagorical effects.

The advert for the Polyphantasma is more obscure. It suggests an instrument or a method for projecting multiple figures at once, but it is not clear how this was achieved, or whether this was an addition to an existing lantern or an entirely new instrument. The only reference to the Polyphantasma that I have found elsewhere is in a set of cards illustrating different optical principles, drawn by Mary Lewis around 1828 (fig. 35).[30] The latter cards in the series illustrate optical instruments such as the refracting telescope, magic lantern, and Polyphantasma. These cards illustrate the principles of the instruments in diagrammatic form, so it remains unclear what the Polyphantasma might have looked like, but it was evidently a device or technique for

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[30] These cards are a unique set held in the UCLA library. They are most likely a hand-drawn (or hand-copied) set of educational picture cards, similar to the astronomy picture cards by Pâris and Wallis.

projecting multiple images from a single figure, lit by multiple illuminants. Again, this instrument disappeared from Blunt's advertisements after only one mention.[31]

Blunt entered the nascent domestic media market as it was only just beginning to stabilise into a distinct field of its own. In 1814, it was not yet clear what the market for entertainment media would look like. Blunt had quite astutely identified a demand for lanterns, drawing tools, and similar instruments among the middle classes, but there were few prior examples to suggest how to exploit this opening. He published a (now lost) descriptive essay on the magic lantern in 1815, to provide 'an account of the various instruments and contrivances for exhibiting optical deceptions' ('Select Literary Information' 1815: 429). Blunt had already produced a descriptive work on the magic lantern, years before Carpenter, but his advertisements suggest that he had only a very general idea of what his projection equipment was for. Carpenter sold a clearly branded Improved Phantasmagoria Lantern and established a viable use pattern and market identity; Blunt sold poorly-defined 'contrivances'. He prefigured many of Carpenter's strategies, framing his lantern as educational and producing accompanying publications, while also selling strange dark lanterns, window-projection arrangements, and multi-image projectors. He exited the market just as the Kaleidoscope was about to explode.

Blunt's idiosyncratic instruments and commercial failure do not necessarily demonstrate practical flaws in his business approach. Many of Carpenter's innovations were also practical dead ends, not followed by later manufacturers. His early belt-attached lantern was likely a practical and commercial failure, despite the praise it has received from historians (Willis 2012), while the Copper-Plate Sliders had little demonstrable effect on future slide production. There is little evidence of other manufacturers replicating Carpenter's approach. The practice of hand painting slides remained almost universal until the 1860s. Painting was a very old solution to the problem of reproducing images. It produced inaccurate figures in comparison with printed reproduction, but it was appropriate to the purposes of lantern retailers, who served an audience that did not especially prize accuracy of reproduction (Carpenter had gambled to the contrary). As Mokyr shows, even beneficial improvements can be rejected by their user groups (1998). There were already perfectly adequate slide

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[31] The other advertisements present reapplications of existing instruments. The Megalascope was a pocket telescope that could be repurposed as a microscope; Blunt's new orrery was really no more than a set of celestial models and a suggestion of how they might be hung; 'The Peace' was a magic lantern and screen arranged in front of a window, so as to project images to be seen from the outside 'on occasions of public rejoicings'. The name of the latter apparatus refers to peace in Europe after the abdication of Napoleon in 1814. Blunt was somewhat premature; Napoleon would escape Elba and return to power at the beginning of 1815, before his eventual defeat that summer.

production networks in place and it added little additional value to invest in copper engravings. Scholars have mistakenly appraised Carpenter's printing process as an early example of later reproduction techniques, but it is closer to Blunt's Pentagraphic process in its long-term impact. Neither photographic nor lithographic reproduction owed anything to the copper-plate process.

Blunt shatters Carpenter's reputation as a unique lantern innovator. He demonstrates that there were other practitioners attempting to solve similar problems with variant methods. These problems did not merely concern automatic slide production or new types of lantern, but rather how to best exploit a changing market and its opportunities. The continuity of Blunt and Carpenter's educational discourses suggest common approaches to lantern retail that replicated existing discourses in popular scientific publishing. Blunt's failure to establish himself in the emerging market is curious, considering Carpenter's success only a few years later, but it can be explained by considering how these practitioners were differently embedded in their respective manufacturing and retail contexts. As Bijker and Rossell both propose, we should consider how technological practice is set in a technological frame and moulded by its interaction with different user groups.

Both Blunt and Carpenter were opticians and instrument makers by trade, but their professional trajectories propelled them outwards, into a non-scientific market for novelty goods. They each navigated this differently, maintaining distinct relationships with the knowledge and practices of the optical trade. Blunt was located in Covent Garden and embedded, through apprenticeship and family, in the London instrument trade. Successor to Nairne & Blunt, he was wedded to continuing trade practices (Morrison-Low 2009: 135-174), producing bespoke instruments to order (Porter 1985: 3), or maintaining a retail stock produced elsewhere (McConnel 1994). Without a surviving catalogue, it is impossible to see what Blunt sold and at what price, but his adverts give every indication of them being expensive instruments and bespoke sets. Carpenter, on the other hand, was an outsider. He began working in Birmingham, away from the dominant London instrument trade but itself a major centre for small-workshop manufacture. These respective local contexts provided different relationships to the concepts and techniques of instrument making (Bijker 2012 [1987]: 168). Carpenter's relationship with the Birmingham manufacturing networks made a tremendous difference to his practice.

At the beginning of the century, local contexts helped to define instrument makers' manufacturing and retail practices. They were dependent on local infrastructures for access to materials and labour, and while London and Birmingham

both had advanced production capabilities, these were manifested in different ways. Birmingham was becoming the leading global supplier of small goods, capable of mass-producing many thousands of fancy items and machine parts through an advanced workshop economy. Blunt's bankruptcy is a symptom of changing conditions in the instrument trade. Middle-class incomes were rising, the potential market for consumer media was growing, and new practices were required to navigate this new commercial landscape. The nexus of these early transformations occurred in Birmingham, as I will later show. But the fame of London retail still projected powerful discourses and concepts. This only partially concerned the lantern, as one instrument in a wave of popular crazes that captured imaginations in the early decades of the century. Let's consider these products, and lantern's relationship with analogue trades intersecting the consumer retail networks.

Figure 32. Dark lanterns



Early dark lantern, c.1600.
Ashmolean Museum, Ref: AN1887.2.
Supposedly used by Guy Fawkes on the night of the Gunpowder Plot.



Dark lantern with bulls-eye lens, c.1845-1900.
Greater Manchester Police Museum.
Police lantern by Hiatt & Co. of Birmingham.



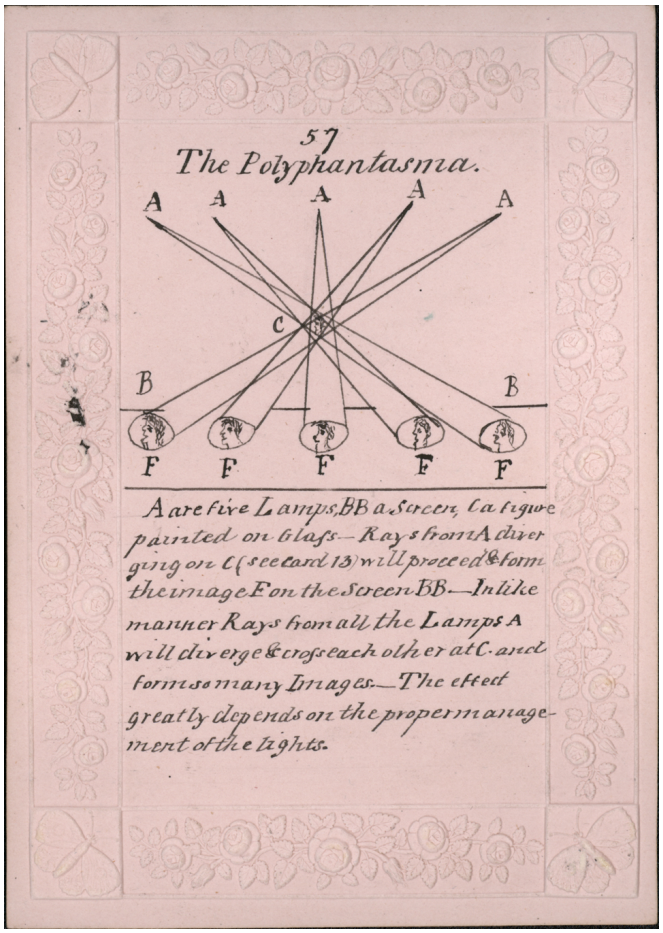
Figure 33.
Dark lantern / magic lantern hybrid, 1780-1820.
François Binétruy, Ref: LM 79.



Figure 34.
Title leaf illustration in *Apparitions; or, the Mystery of Ghosts, Hobgoblins, and Haunted Houses, Developed* by Joseph Taylor (2nd ed.), 1815.

Figure 35. Optical diagram picture cards, 1828.
UCLA Library, Ref: MS. Coll. no. 347.
From a set of 58 hand-drawn picture cards by Mary Lewis of Birmingham.





Chapter 4.

Consumer Media in Analogue Trades

I. These Toys Weren't Invented, They Were Grown

The instrument trade, now transforming around Blunt, Carpenter, and their peers, was itself caught in a tangled web of further trades. The printers, clock makers, fabric sellers, jewellers, tobacconists, hatters, tailors, and box makers were all coming to terms with a changing commercial landscape. Many were beginning to produce novelty items for the first time. The trades were all responding to common economic and cultural conditions that made it profitable to appeal to the middle-class market. This resulted in a series of incredibly successful new products. This was the era of the first media crazes.

The Phantasmagoria Lantern was preceded by the Kaleidoscope and the paper transparencies, and followed by the Myriorama, Thaumatrope, Praxinoscope, and Stereoscope. These devices contributed to a cumulative public understanding of visual media. They presented new practices that were taken up by other trades and fired at the public as the new next greatest thing. The emerging lantern trade was integrated into a broader network of practices; it was not a hermetic business all of its own. Reconsidering Carpenter's influence in this wider context, we can establish more typical media practices and show how the lantern became an established consumer object alongside other domestic media instruments.

This chapter will show common practices across different trades, looking principally at the novelty retailer John Scott and the publishers Rudolph Ackermann, William Phillips, Samuel Leigh, and Edwin Pearson. I will explore the trade origins of the Thaumatrope, Myriorama, and Phenakistiscope. These are well-known devices, but scholars have failed to account for their practical emergence, preferring stories of brilliant inventors to the everyday patterns of publishers and their customers. The publishers demonstrate how analogue trades were mirroring the retail strategies of the

instrument makers, filling the same commercial niche with new products of their own. From the publishers, I will then draw in the painters, demonstrating the complex trade links between all of these different practitioners. The trades require a structural history to explain their interdependence.

II. John Scott, The Novelty Paint Seller

At the end of the eighteenth century an advertisement for novelty instruments was published by John Scott of the Strand (fig. 38). The advertisement was titled 'RATIONAL AMUSEMENTS for the year 1797', and featured various instruments and curiosities:

SCOTTS RATIONAL AMUSEMENTS

Nº.

1. A Machine to Tell Hidden Thoughts

[…]

6. Magic Perspective, reads concealed Letters in a Box

[…]

11. An Instrument to See through a Board

[…]

40. The Magic Clock

41. The Sagacious Swan, a large instrument

[…]

48. The Impenetrable Secret (Heard 2006: 191)

This is a curious and impermeable price list; not filled with recognisable instruments or meeting established consumer needs, but enticing purchasers to engage with unknown objects, whose chief appeal was their sense of wonder.

The advertisement explains that Scott's instruments were intended to replace the labour of preparing amusing tricks at home:

> THE PUBLIC are respectfully reminded, That many Books have been written, explaining how a Variety of entertaining Matters may be Prepared, few of which are remarkable for any Thing but the Difficulty of being understood, and some mathematical Phrases which the generality of Readers are unaccompanied with. But, even Allow some Truths, the Difficulty of collecting Materials, and uniting them to perfect the Instruments must be attended with much Trouble, Delay and Experience,

> and could only be performed by a Mechanical Hand. And, admit our countrymen may justly boast finer Executions in Mechanics than any other Nation, yet the Price of ingenious Artists is treble that of most other Countries in Europe, besides the Disadvantage of employing them in a Work totally strange to them. (Heard 2006: 191)

Like Blunt and Carpenter, Scott advertised 'rational amusements', but unlike the later instrument makers, his marketing discourse does not admit the worth of practical knowledge. The advertisement points to popular uses of scientific or instructive books to create home illusions. Francois Niceron's *La perspective curieuse* (1638), and its successors, inspired many to recreate pleasing tricks and transformations for themselves. This required knowledge of perspective and some mechanical or drawing skill. According to Scott, the difficulty and expense of home preparation is not worth the trouble of learning 'mathematical Phrases'. Better to allow his artisans to build them for you than work from the instructive books yourself.

Scott was not an instrument maker. He professionally prepared colours, inks, and dyes for artists (Heard 2006: 192; 'John Scott' 2011). He is, in the 1803 *Kent's Directory*, a 'Water Colour Preparer' (1803: 177). In the 1794 *Wakefield's Directory* he is a 'New Invented Colour Cake and Crayon Manufacturer' (1794: 273). He produced a very successful blue dye called 'SCOTT's LIQUID TRUE BLUE' (Heard 2006: 191; Kilburn 2002: 16; Brokaw 2013 [1988]), alongside chalks, pencils, pastels, drawing paper, pallet knives, and 'all Necessities for Drawing and Colouring' (Heard 2006; 'John Scott' 2011). He was, in many ways, very much like Charles Blunt, who specialised in drawing tools and mechanical devices, but employed analogous practices from a different trade entirely. Scott was not driven by the expansion of the instrument trade into popular markets, but came to an awareness of a public appetite for rational amusements from a different form of retailing. For him, these strange instruments were another form of fancy goods, interchangeable with fine fabrics or dazzling colours.

Yet if we read through the amusements that Scott offers, we find items familiar to the instrument seller, or the collector of optical toys:

> 27. A Changeable Picture or Treble Painting
>
> 28. A Cone Cylinder, to right Distorted Figures
>
> 29. An Upright Cylinder, for Ditto
>
> 31. A Magic Book with Ten Changes
>
> 32. A Ditto, Different
>
> […]

35. Magic Drawings, or optical changes, with Twelve Variations

36. Magic Drawings, Likenesses of Known Personages

[…]

A Neat Magic Lantern, Twelve fine Painted Slide Variations, complete

A Ditto

A Ditto

A Ditto

A very capital Magic Lantern in a Mahogany Case, with Twenty-one single and Three double Glass Sliders, finely painted, having One of the Glasses of Figures to ascend and descend, forming a complete apparatus

(Heard 2006: 191)

Scott sold printed anamorphic pictures, with a conical or cylindrical mirror to correct their distorted images, and transparencies (fig. 36; Füsslin 2014: 164-183; Mannoni, Nekes and Werner 2004: 88-99; Weynants 2003a), pictures that were altered or illuminated when viewed against a light source (fig. 37; Robinson 2015; Füsslin 2014: 187-193; Mannoni, Nekes and Werner 2004: 64-77). He also sold 'neat' or 'very capital' magic lanterns, not yet explicitly rational, but nevertheless targeted towards an affluent middle-class. He was certainly not the first to do so.

A lantern marked 'Scott, Nº 417 Strand, London' survives in the Cinematheque Française (fig. 39).[32] There are some few surviving slides in the Science Museum and Bernd Scholze's collection (fig. 40). These illustrate amusing characters or short sequences in the style of the Galantee showpeople. One has two anthropomorphic monkeys in different phases of dance, accompanied by a monkey fiddler and his dog; another shows the stages of a ship's mast falling in a storm. These are not the educational images sold by Blunt and Carpenter. They are short sketches meant to entertain or charm the viewer. Despite Scott describing his wares as 'rational', his lanterns are not framed in an educational discourse at all. Another advertisement presents his lanterns in a quite frivolous context:

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[32] The surname-only maker's mark is inconclusive. It is possible that this lantern is by George Scott, who succeeded to John Scott's business, and who also sold lanterns (G. Scott 1822: 3). Given that George's advertisements list almost identical stock to John's earlier ones (watercolours, nankeen dyes, etc.), it seems likely that his magic lanterns were the same also. There is no evidence of George having renewed his lantern output following Carpenter's improved lanterns in 1821.

AMUSEMENTS FOR WINTER EVENINGS

> The MAGIC LANTERN is a pleasing family amusement, well suited to all ages and sexes, ready in a few minutes for the entertainment of friends or family—in fact a cheerful house should never be without one.
>
> J. SCOTT has prepared an extensive assortment. They are complete in boxes, each Lantern with twelve glass slides, on which are finely painted about sixty grotesque figures, which by reflection, are magnified from a miniature as large as nature, according to the size of the Lanterns, and are well adapted for youth, at this season. (Scott 1797)

These ‘cheerful’, ’pleasing’, and ‘grotesque’ views remain in the common entertainment paradigm of the era, and are closely aligned with Scott’s miscellaneous amusements. He also provided a description of how a lantern might be used:

> The Whole being an Entertainment of Three or Four Hours for a Party of Friends or Family, performed with Ease by any Lady or Gentleman by Following the Instructions, yet appearing truly wonderful to those not in the Secret. (Heard 2006: 191)

This indicates that his clientele did not already possess an inherited understanding of the medium, unlike later audiences. Like Scott’s Magic Mirror, or the concealed figures of his Harlequin Box, the lantern was an instrument of magic properties, able to conjure strange figures before an ignorant audience. This was the last moment when the lantern could be an item of deception. Twenty-five years later, it was more astute for Carpenter to describe the mechanics of the lantern than to obfuscate them (1995 [1823]). By then, the discursive frame of the instrument had shifted towards education, and the lantern was on its way to becoming an everyday occurrence.

Scott came from a different trade to the lantern retailers we have seen. He was a seller of paints and fancy goods, and as such did not have the skillset, nor the trade connections, to manufacture his own instruments. He imported his goods from Saxony. Another advertisement explains that he sold:

> fanciful entertainments for the fireside, with instruments for their use, being upon an entirely new principle such as has not been seen in this country, being just received from an established manufactory in Saxony. (Heard 2006: 193; Brokaw 2013 [1988])

This points to a transnational trade that has been little researched. It confirms that Scott was a retailer only and not manufacturing his own lanterns.

Scott participated in a wide distribution network for inexpensive goods and domestic gadgets made from the workshops of central Europe. As Rossell shows, the southern German states had proficient workshop economies of metalworkers and glass makers. He explains that a shared style of bullseye lantern was established by lantern makers around Nürnberg (2003). This is further evidence of a matrix of shared practices, suggesting that there may have been localised modes of practice specific to different locations or manufacturing traditions.[33]

Scott's case demonstrates how analogue practices may be used by practitioners working across different trades. His advertisements cease at the beginning of nineteenth century, coinciding with the growing influence of British instrument makers in the domestic market and his own deviation into the popular exhibition landscape. Scott opened the Sans Pareil Theatre in 1804, a few doors down from his shop on the Strand (Heard 2006: 193). He continued to use lanterns as part of his theatrical apparatus (Heard 2006: 203-206), but does not seem to sell them anymore. It is likely that his import business was affected by the continental blockade of Britain enacted by Napoleon between 1806 and 1814 (Heidler and Heidler 2004: 48). The blockade brought an embargo against formal trade with Britain, reducing transnational business and removing continental competitors from British markets. This opened a window of eight years, during which London, Sheffield, or Birmingham could flood an unopposed market with their own instruments and toys.

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[33] Including the early horizontal-cylinder lantern common in the southern German states (Rossell 2009: 15-18), vertical-cylinder lantern in the London style (Rossell 2009: 18-19), and square-bodied Nürnberg bullseye lantern (Rossell 2003).

Figure 36. Anamorphoses



Anamorphic picture with conical mirror, c.1800. Museu del Cinema, Ref: 00886.

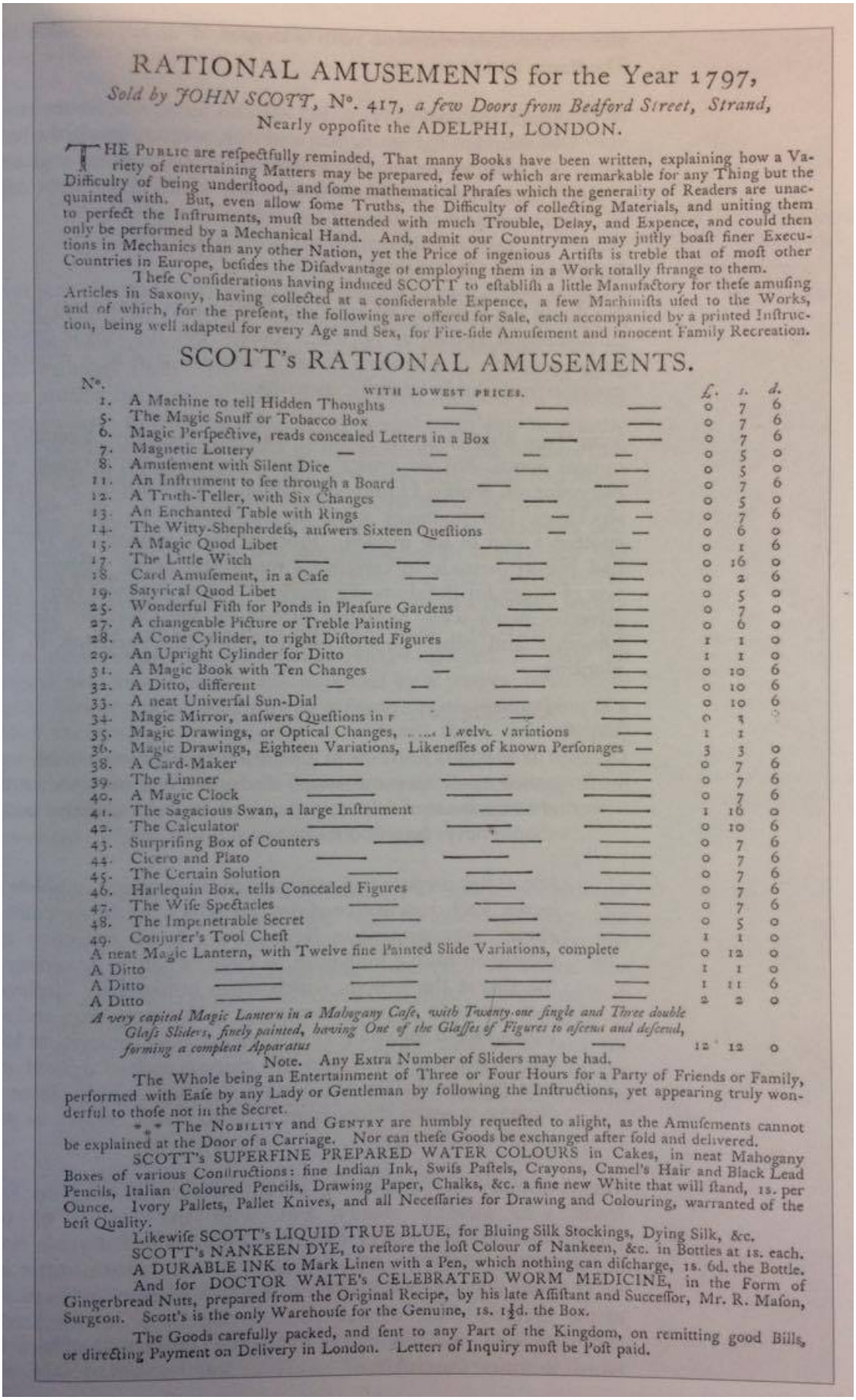


Anamorphic picture with cylindrical mirror, c.1800. Museu del Cinema, Ref: 00885.





Figure 37. The Annunciation, c.1800.
National Science and Media Museum, Ref: Cab.G / Dr. 5 / Box 1.
Printed and hand-coloured transparency [lit from the front and the back].



RATIONAL AMUSEMENTS for the Year 1797,

Sold by JOHN SCOTT, N°. 417, a few Doors from Bedford Street, Strand,
Nearly oppoſite the ADELPHI, LONDON.

THE PUBLIC are reſpectfully reminded, That many Books have been written, explaining how a Variety of entertaining Matters may be prepared, few of which are remarkable for any Thing but the Difficulty of being underſtood, and ſome mathematical Phraſes which the generality of Readers are unacquainted with. But, even allow ſome Truths, the Difficulty of collecting Materials, and uniting them to perfect the Inſtruments, muſt be attended with much Trouble, Delay, and Expence, and could then only be performed by a Mechanical Hand. And, admit our Countrymen may juſtly boaſt finer Executions in Mechanics than any other Nation, yet the Price of ingenious Artiſts is treble that of moſt other Countries in Europe, beſides the Diſadvantage of employing them in a Work totally ſtrange to them.

Theſe Conſiderations having induced SCOTT to eſtabliſh a little Manufactory for theſe amuſing Articles in Saxony, having collected at a conſiderable Expence, a few Machiniſts uſed to the Works, and of which, for the preſent, the following are offered for Sale, each accompanied by a printed Inſtruction, being well adapted for every Age and Sex, for Fire-ſide Amuſement and innocent Family Recreation.

SCOTT's RATIONAL AMUSEMENTS.

N°.	WITH LOWEST PRICES.	£.	s.	d.
1.	A Machine to tell Hidden Thoughts	0	7	6
5.	The Magic Snuff or Tobacco Box	0	7	6
6.	Magic Perſpective, reads concealed Letters in a Box	0	7	6
7.	Magnetic Lottery	0	5	0
8.	Amuſement with Silent Dice	0	5	0
11.	An Inſtrument to ſee through a Board	0	7	6
12.	A Truth-Teller, with Six Changes	0	5	0
13.	An Enchanted Table with Rings	0	7	6
14.	The Witty-Shepherdeſs, anſwers Sixteen Queſtions	0	6	0
15.	A Magic Quod Libet	0	1	6
17.	The Little Witch	0	16	0
18.	Card Amuſement, in a Caſe	0	2	6
19.	Satyrical Quod Libet	0	5	0
25.	Wonderful Fiſh for Ponds in Pleaſure Gardens	0	7	0
27.	A changeable Picture or Treble Painting	0	6	0
28.	A Cone Cylinder, to right Diſtorted Figures	1	1	0
29.	An Upright Cylinder for Ditto	1	1	0
31.	A Magic Book with Ten Changes	0	10	6
32.	A Ditto, different	0	10	6
33.	A neat Univerſal Sun-Dial	0	10	6
34.	Magic Mirror, anſwers Queſtions in r	0	5	
35.	Magic Drawings, or Optical Changes, ... Twelve Variations	1	1	
36.	Magic Drawings, Eighteen Variations, Likeneſſes of known Perſonages	3	3	0
38.	A Card-Maker	0	7	6
39.	The Limner	0	7	6
40.	A Magic Clock	0	7	6
41.	The Sagacious Swan, a large Inſtrument	1	16	0
42.	The Calculator	0	10	6
43.	Surpriſing Box of Counters	0	7	6
44.	Cicero and Plato	0	7	6
45.	The Certain Solution	0	7	6
46.	Harlequin Box, tells Concealed Figures	0	7	6
47.	The Wiſe Spectacles	0	7	6
48.	The Impenetrable Secret	0	5	0
49.	Conjurer's Tool Cheſt	1	1	0
	A neat Magic Lantern, with Twelve fine Painted Slide Variations, complete	0	12	0
	A Ditto	1	1	0
	A Ditto	1	11	6
	A Ditto	2	2	0
	A very capital Magic Lantern in a Mahogany Caſe, with Twenty-one ſingle and Three double Glaſs Sliders, finely painted, having One of the Glaſſes of Figures to aſcend and deſcend, forming a compleat Apparatus	12	12	0

Note. Any Extra Number of Sliders may be had.

The Whole being an Entertainment of Three or Four Hours for a Party of Friends or Family, performed with Eaſe by any Lady or Gentleman by following the Inſtructions, yet appearing truly wonderful to thoſe not in the Secret.

*** The NOBILITY and GENTRY are humbly requeſted to alight, as the Amuſements cannot be explained at the Door of a Carriage. Nor can theſe Goods be exchanged after ſold and delivered.

SCOTT's SUPERFINE PREPARED WATER COLOURS in Cakes, in neat Mahogany Boxes of various Conſtructions: fine Indian Ink, Swiſs Paſtels, Crayons, Camel's Hair and Black Lead Pencils, Italian Coloured Pencils, Drawing Paper, Chalks, &c. a fine new White that will ſtand, 1s. per Ounce. Ivory Pallets, Pallet Knives, and all Neceſſaries for Drawing and Colouring, warranted of the beſt Quality.

Likewiſe SCOTT's LIQUID TRUE BLUE, for Bluing Silk Stockings, Dying Silk, &c.

SCOTT's NANKEEN DYE, to reſtore the loſt Colour of Nankeen, &c. in Bottles at 1s. each.

A DURABLE INK to Mark Linen with a Pen, which nothing can diſcharge, 1s. 6d. the Bottle.

And for DOCTOR WAITE's CELEBRATED WORM MEDICINE, in the Form of Gingerbread Nuts, prepared from the Original Recipe, by his late Aſſiſtant and Succeſſor, Mr. R. Maſon, Surgeon. Scott's is the only Warehouſe for the Genuine, 1s. 1½d. the Box.

The Goods carefully packed, and ſent to any Part of the Kingdom, on remitting good Bills, or directing Payment on Delivery in London. Letters of Inquiry muſt be Poſt paid.

Figure 38.
Advertisement for John Scott, 1797. Ricky Jay collection.





Figure 39.
Bullseye magic lantern by John Scott, 1790-1810.
Cinémathèque Française,
Ref: AP-95-1608.



Figure 40.
Slides by John Scott, 1790-1810. Bernd Scholze collection.

III. The Printers and the Paper Toys

In 1825, John Ayrton Paris invented the Thaumatrope (Barnes 1995: 7-11), a small illustrated cardboard disk that, when spun, superimposed pictures on each side into a composite image. Like the Phantasmagoria Lantern, it was marketed as a new optical novelty and integrated into a discourse of scientific learning.[34] But the Thaumatrope was embedded in different production and intellectual networks. It was made by the printers, not the instrument makers, and sold in bookshops and stationers'. It was also marketed and sold through the Royal Institution, and its myth of invention connected it to famous intellectuals like John Herschel, William Fitton, and Charles Babbage (Mannoni 2000 [1996]: 205-207).

The device is most often seen as a very early stage in the slow evolution of motion pictures, but it was more important in its day for the retail strategies adopted to sell it and the trade infrastructures supporting it. The Thaumatrope was not, as is often supposed, a distant ancestor of later mechanical animation devices, nor a relative of the domestic instruments sold by the instrument makers.[35] It was part of a distinct category that I will call paper toys. These were novelty devices made and sold by printers and publishers, and as such distinct from lanterns, Kaleidoscopes, and fleaglasses, which all required the skills and connections of an optical instrument maker.[36] Paper toys were integrated into a different retail and production context. They required the skills and collaborative networks of a printer, who could produce matrices, handle inks, and leverage papermakers to provide materials, or publishers to reach a paying public. Like Scott, they used different practices to access the same market. As Berg shows, innovative new products were developed to exploit complementary frameworks (1998). The Thaumatrope was an analogue media to the Phantasmagoria Lantern. It targeted the same market, using similar appeals to popular science, but required the production networks of a different trade.

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[34] Brewster, continuing his programme of attributing modern scientific explanations to all classical literature, claims that Homer was familiar, in principle, with the Thaumatrope's effect (1826: 87; Herbert 2000: 245; Hecht 79).

[35] Optical toys were first conceptualised as relating to the principles of animation by W.B. Carpenter in his writings on the Zoetrope (1868). They were later subsumed into a teleological pre-history of cinema by many writers (Ceram 1965: 18-20; Mannoni 2000 [1995]: 201-222).

[36] My definition is producer-led: a paper toy is made by a publisher, an optical toy by an optical instrument maker. This has the benefit of foregrounding the unique production context of each and leaves space for novelties emerging from other manufacturing paradigms (clockwork toys, tin toys, wooden toys, or mathematical toys). These categories are not hermetic. There may be crossover between artisans.

This new concept offers a more useful basis for study. The paper toys may include other novelties, such as the miniature peepshows, transparencies, and anamorphoses. A wide variety of amusing commodities were produced by printers at the beginning of the nineteenth century. Paper peepshows (Füsslin 2014: 134-136; Hyde 2015; Balzer 1998) and dioramas (Füsslin 2014: 70-75) were made throughout the eighteenth century, Vue d'optiques (Füsslin 2014: 82-83, 114-115) emerged at the century's end, and paper panoramas (Füsslin 2014: 130-133) in the first years of the nineteenth century. Many curious images and paper novelties had long been produced, with no definite beginning or established history; this included the anamorphoses and other metamorphic prints (Füsslin 2014: 140-143; Mannoni, Nekes and Werner 2004: 100-112), domino combination cards (Füsslin 2014: 148-149; Mannoni, Nekes and Werner 2004: 113), ombre blanches shadow cards (Füsslin 2014: 151-153), and ombre chinoises shadow puppets (Füsslin 2014: 156-158).

The first commercial paper transparencies were published by Rudolph Ackermann around 1796, 'anticipating rival claimants by some three years' (Ford 2004: 143; Rickards 2000: 339). He published numerous transparencies between 1796 and 1802 and, as was also typical of the instrument makers, a companion booklet, called *Instructions for Painting Transparencies* (1799). Rival publisher Edward Orme also claimed the invention for himself in *An Essay on Transparent Prints* (1807), but this ignored the history of large-scale theatrical transparencies (Robinson 2015: 1-3), and was long after the fact. The prints were first produced, in his account, by a fortuitous accident. *The Monthly Review* reports:

> Mr. Orme does not altogether contend for originality in the invention of which he treats, but describes the accidental circumstances that led him to the present publication:
>
> 'In trying to improve the varnish generally used for oil paintings, some of it dropped unnoticed on the dark part of an engraving; which being afterwards exposed against the light, the spot where the varnish had been split formed a light in the midst of shadow. This, being daily before my eyes suggested the idea of producing, by the same means, a strong transparent light in prints previously prepared for effect. Accordingly, the first attempt was made on a print of Sir Bertrand in the Haunted Castle; —which, being the only engraving that had ever appeared in this style, was many months before it attracted the public notice; but the moment it became known, the demand for it was uncommonly great. (1809: 215-216)

There is no scholarly history to provide a trustworthy timeline of emergence for each paper curiosity, or explain how printers and publishers navigated the novelty market. Most accounts do not even distinguish them from the optical toys, neglecting the unique paradigm that gave birth to the paper toys and continually reinvented them. Where these toys feature in the literature, they tend to be taken as evidence of perceptual transformations occurring across the century (Crary 1990; Flint 2000; Gabriele 2016), or as indicative of emerging modes of modernity (Armstrong 2008; Barnaby 2016). The existence of optical and paper toys is taken for granted by scholars more concerned with technological or literary history, without addressing their unique conditions of emergence.

While I am unable to provide a comprehensive study of paper toys and their paradigmatic structures here, I would like to use their case to identify analogue practices adopted by the printers. By framing these toys according to the skills required to produce and distribute them, I open a new perspective that can better account for media emergence. It is no coincidence that Ackermann was among the first to produce transparencies in the final years of the eighteenth century and then, later, also the Phenakistiscope in the 1830s. He had the production capabilities and an established market that could exploit both. Focusing on inventors alone would obscure connections between the two curiosities.

IV. William Phillips and the Thaumatrope

The Thaumatrope (fig. 41) was first documented in April 1825, in an entry at Stationers' Hall, credited to its publisher William Phillips of George Yard (Barnes 1995: 8) and, simultaneously, in *The New Monthly Magazine,* credited to its inventor J.A. Paris:

> Dr. Paris, an ingenious physician at the West end of the town, has just invented an amusing and philosophical toy, called the Thaumatrope. […] The Thaumatrope is composed of circular cards about the size of a crown piece, to each side of which is fastened a string, which you twist round, and thereby render visible to the eye the objects painted on both sides of the card. For example, on one side of the card is painted a cage, on the other a parrot; by whirling round the card rapidly, the bird appears in the cage. (1825: 177)

Later, in January 1826, Brewster cautiously confirmed that the Thaumatrope was 'invented, we believe, by Dr. Paris' (1826: 87).

Paris was a physician and medical researcher. In 1827 he published (at first, anonymously) a popular book called *Philosophy in Sport Made Science in Earnest* (1827). This text presents a series of dialogues on various entertaining or instructive topics, revolving around the learned Mr. Seymour explaining the principles behind everyday toys and games. He makes a contract with his son, Tom Seymour, that he will teach him new games on the condition that Tom can recount the scientific basis of each (Paris 1833: 11-12). The dialogue sets Mr. Seymour's modern scientific knowledge against astounded children and ill-tempered, unimaginative adults.

> 'I have long thought', said Mr. Seymour, 'that all the first principles of natural philosophy might be easily taught, and beautifully illustrated, by the common toys which we have invented for the amusement of youth'.
>
> 'A fig for your philosophy', was the unceremonious and chilling reply of the vicar. (1833: 13).

Peter Twaddleton, a sceptical vicar, plays a contrarian (yet quickly-convinced) foil to the visionary lead. The vicar need not be so shocked by the idea of finding entertainment in instruction, nor Mr. Seymour quite so self-satisfied; most optical toys were already marketed as instruments of philosophical instruction. When Mr Seymour states his thesis he is, perhaps unknowingly, voicing the entire project of 1820s popular scientific publishing. '*Play* and *work—amusement* and *instruction—toys* and *tasks*—are invariably but most unjustifiably employed as words of contrast and opposition' (1833: 19). *Philosophy in Sport* does not retain this unnatural opposition.

Paris never publicly claimed responsibility. An 1856 letter to Michael Faraday shows him accepting credit, in private at least:

> I was first induced to publish it, at the earnest desire of my late friend Wm Phillips, who was the first person to whom I shewed it; & he undertook to get the subjects lithographed, & to arrange the sale of it. It was, of course, soon pirated, & spurious copies distributed. A large number was exported to India, but the Captain turned out a rogue, deserted his cargo, & has never since been heard of—so much for my first & last merchantile speculation. I however gained about £150 from the sale in this country, which was expended for educational objects in my family; so here then you have 'a true and particular account of that wonderful phenomenon termed the Thaumatrope', as the showman would say. I may add that I never put my name to it. (Herbert 2013a)

The toy was given institutional scientific credibility by the Royal Institution, helping it to notable success.[37] The full story of the Thaumatrope's release, the discourses surrounding it, and the petty disputes between Paris and Babbage, is well told by Herbert (2013a).

I want to note here that Paris was not the only figure involved in creating the Thaumatrope. Although most scholars are more attentive to its inventor, the Thaumatrope was manufactured by William Phillips. As Paris reports to Faraday, Phillips 'undertook to get the subjects lithographed & to arrange the sale of it'. The registry of the device at Stationers Hall even records Phillips instead of Paris. This is because, in the opinion of the Worshipful Company of Stationers, he was the producer and rights-holder. Phillips had sole right to make and distribute the Thaumatrope, and it is his maker's mark that appears on the earliest versions. The first edition of *Philosophy in Sport* even credits Phillips (in a footnote):

> We have since learned that Mr. Beacham obtained this toy at Mr. William Phillips's, George Yard, Lombard Street, the publisher. We mention this circumstance to guard the reader against inferior imitations which are vended in the shops of London. (1827 [Vol. 3]: 2).

This note is excised from later editions, which more explicitly press Mr. Seymour's (and thus Paris's) claim to invention (Barnes 1995: 8-10).

That Paris never put his name to it was not out of modesty, but because he only produced a concept. He had neither the skills, tools, nor trade connections to manufacture the Thaumatropes himself. Indeed, the skill threshold was imperative; while Paris could not produce the toy himself, there were numerous other manufacturers who could, and did, produce 'spurious copies' (Herbert 2013a; fig. 42).

William Phillips was a printer, bookseller, and amateur geologist (Torrens 2004: 159). He co-founded the Askesian Society, a club for scientific thinking. His father James Phillips, was also a bookseller. He sold religious books and pamphlets for the Society of Friends (1770), of which he was a member, and many anti-slavery treatises (1791: 18-21). William's trade was in the same sphere (1813, 1818b), but also stretched into scientific books, following their rising popularity in the new century (1815, 1817, 1818s, 1818c, 1823). There is no evidence of either printer having previously made toys, but both also stocked maps and stationary, as was standard, and William is known to have provided grave-makers' forms, which suggests that he had supplied

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[37] Not everyone accepted its scientific claims. A playful article in *John Bull* satirised the association of the toy and the Royal Institution, mocking the pomposity of its scientific framing (1825; Herbert 2013a).

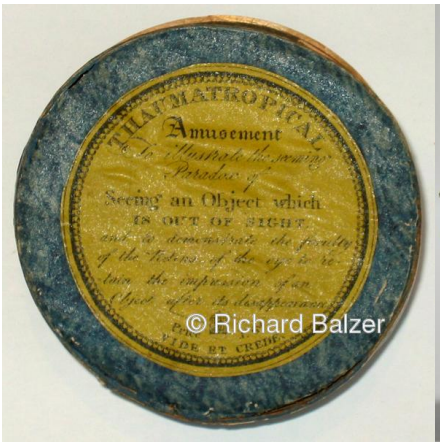
printed materials to other fields than the book trade (Rickards 2000: 66). He was a familiar of Paris because of his involvement in the London scientific societies and it is in this context that the Thaumatrope would have been suggested to him.

Much scholarship frames the Thaumatrope as a startling new optical curiosity, rooted in Faraday's observations of moving cogwheels and Roget's studies of optical deception (Wade 2004b; Mannoni 2000 [1995]: 205; Chanan 1996: 56-62). But in the context of a broader trade, already producing transparencies and metamorphic views, it was a non-standard, but quite normal, part of a publisher's professional output. It was firmly in the spirit of the moment, with publishers producing numerous original novelties for public consumption. Mayhew interviewed a street-seller of 'optical and magical delusions', who sold sheets of printed Thaumatropes. He named these '"Magical Figures," or rude street imitations of Dr. Paris' ingenious toy, called the "Thaumascope"' (1851 [Vol. 1]: 287). He also sold shadow cards, conundrum puzzles, and grotesque and satirical prints called 'Galleries of Comicalities'. 'Threepenny gallery for a penny!—and dirt cheap at threepence. As big as a newspaper' (1851 [vol. 1]: 286).



Figure 41.
The Thaumatrope; Being Rounds Of Amusement, or, How to Please and Surprise by Turn, 1825.
Lester Smith collection.
Original set of Thaumatropes and box, with hand-coloured engravings by George Cruickshank; published by William Phillips.
When spun, the pictures form a composite image.

Figure 42. Pirated Thaumatropes



THAUMATROPICAL Amusement *To Illustrate the Seeming Paradox of* Seeing an Object which is OUT OF SIGHT, c.1825.
Richard Balzer collection.
Set of Thaumatropes and box, with hand-coloured engravings [unknown maker].



The Magic Circle, c.1830.
Richard Balzer collection.
Set of Thaumatropes and box, with coloured lithographs [unknown maker].



The magic Planisphere, c.1835.
Richard Balzer collection.
Set of Thaumatropes and box, with coloured lithographs; published by Mathias Trentsensky

V. Samuel Leigh and the Myriorama

The 1825 Thaumatrope followed the 1820 Panoramacopia, 1822 Geographical Panorama, and 1824 Myriorama; domestic variants of the moving panoramas (Huhtamo 2013: 46-53). These were interactive paper landscape viewers that miniaturised the giant public exhibitions of the era and framed them in a playful context.

The Myriorama was among the most successful of the paper novelties. It was a set of picture cards that could be arranged in different combinations to build a continuous panoramic landscape (fig. 43). It was invented by Jean-Pierre Brès and first published by Le Feul, a Parisian novelty maker (Hyde 2004: 4; Oettermann 1997 [1980]: 67-68). Like the astronomical diagram cards of the 1790s, the Myriorama was quickly pirated by British publishers, led by Samuel Leigh of the Strand, who employed the artist John Clarke to design a new variable panoramic landscape for publication.

Where Phillips had entered the novelty print market from a position of relative ignorance, Leigh specialised in popular books and artistic toys (Leigh 1826: 21-24, 1827a: 488-490). This included popular texts for travellers and topographic books to provide views of landscapes and foreign cities (Leigh 1816, 1827b). He had an established trade that could project novelties into the popular imagination. Again, the Myriorama was presented as an amusing scientific novelty. An advertising handbill announced:

> The Myriorama is a movable Picture, consisting of numerous Cards, on which Fragments of Landscapes, neatly coloured, and so ingeniously contrived that any two, or more, placed together, will form a pleasing View; or if the whole are put on a table at once, will admit the astonishing Number of 20,922,789,888,000 Variations: it is therefore certain, that if a person were occupied night and day, making one change every minute, he could not finish the task in less than 39,807,888 years, and 330 days. (Leigh 1826: 22)[38]

The *Morning Chronicle* called the Myriorama 'one of the most diversified and exhaustless inventions for variety and pleasing amusement that has hitherto appeared' (1824: 3). Other newspapers emphasised its artistic connotations. The *News* said that it was 'peculiarly adapted to excite among young persons a taste for drawing' and 'to furnish them with excellent subjects for drawing' (Leigh 1826: 22); The *Literary*

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[38] In 1826 a second series expanded the number of cards from 16 to 24, increasing the possible variations 'to the astounding and almost incredible number of 620,448,401,733,239,439,360,000' (Leigh 1826: 23).

Gazette suggested that ‘as these scenes are capable of great and picturesque diversity, we shall all become, to a certain extent, artists in this style of landscape’ (1826: 22). These were interactive paper novelties produced by the same trade infrastructures as the Thaumatrope, and filling the same market niche as the optical toys, but framed according to the distinct logic of their individual manufacturing and retail paradigm. This shows the complicated interplay of analogue practices and retail contexts (in shops or on the streets) in the lives of domestic novelties. For Mayhew’s street seller, the paper toys were natural lightning rods for the magic lantern’s own projected marvels:

> A superior patterer, of course, shows that his magical delusions and magical figures combine all the wonders of the magic lantern and the dissolving views, ‘and all for a penny’. (1851 [Vol. 1]: 287)



Figure 43.
Myriorama: A Collection of Many Thousand Landscapes, Designed by Clark, 1824.
Bill Douglas Museum, Ref: 69238.
Cards from Myriorama set, designed and engraved by John Clark; published by Samuel Leigh.



Figure 44.
Phenakistiscope, 1833-1840.
National Science and Media Museum, Ref: 1990-5036/7181.
Disc lithographically printed and hand-coloured; published by Alphonse Giroux.
When spun, and viewed in a mirror through the apertures at the disc's edge, the image is animated.

VI. Infinite Makers of the Phenakistiscope

In 1833, eight years after the Thaumatrope, a new animated device appeared on the market. This was the Phenakistiscope (Weynants 2003b, 2003c; fig. 44), a larger disc with printed images in various phases of movement. The images appeared to move when spun and viewed in a mirror through the slits in its edge (Herbert 2013b). The device was invented almost simultaneously by Joseph Plateau and Simon Stampfer (Leskosky 1993; Herbert 2013b), but published by neither.

Again, the Phenakistiscope was put out by the printers and publishing houses. Plateau authorised a Phenakistiscope for sale in Paris, designed by a Belgian artist named Jean-Baptiste Madou. This was immediately copied by Rudolph Ackermann in London, who published a version of the Madou designs as the Phantasmascope in 1833 (fig. 45), followed quickly by a new set of designs by Thomas Talbot Bury (Herbert 2013b; fig. 46). The second set was renamed the Fantascope, and credited Plateau on the inside cover. Also in 1833, a Stampfer-authorised version, named the stroboscope, was published by Joseph Myers & Co., and then shortly afterwards by James Black (Herbert 2013b). All of these different versions were comprehensively pirated by almost everyone in the business. Thomas Mclean, S.W. Fores, William Soffe, and C. Treager, among others, all published animated discs under a variety of bizarre names: The Fantascope, Phantascope, Phantasmascope, Magic Disc, Kaleidorama, Mclean's Optical Illusions, Magic Panorama (Cook 1963: 125).

Like the Phantasmagoria Lantern, Myriorama, and Thaumatrope, the Phenakistiscope was very successful. The instrument bedded into several prevailing discourses, justifying itself through reference to leading scientific ideas (Leskosky 1993) and the deathly iconography of the Phantasmagoria. David Robinson describes one of the Madou designs:

> Demonic green death heads appear to emerge from an infinite hole, growing larger as they approach and pass the viewer. As a piece of Gothic horror it compares with the Phantasmagorian showpieces of Plateau's fellow-countryman, Etienne Robertson. (1990: 251-254; fig. 45)

But the most important aspect of the whole affair is, again, the structural footprint of the Phenakistiscope's exploitation. This was a paper toy sold by paper sellers. It captured something of the discourses on science and wonder, but it was not enabled by them. The Phenakistiscope was impossible without the publishers, printers, and engravers.

An impossibly rare set of copper plates are preserved in the Media Museum (fig. 48). These six plates are engraved with designs for Phenakistiscope discs. One shows the head of the renaissance painter Giotto Di Bondone swallowing (or spitting out) a ball (fig. 47). These are the printing matrices for a set of Phenakistiscope discs.

There are various notes and maker's marks on the plates, which are both illuminating and confusing. The Giotto plate is marked with three different names. Inside the disc on the front, in reverse, and therefore visible on the finished disc, is a publisher's mark: 'Published by Edwin Pearson, 77, Red Lion St, W.C'. The reverse has two separate makers marks: 'T. Large Jun^{R}, Little-New S^{T}, Shoe Lane, London' and 'R. Pontifex & Son, 23 Lisle S^{T} Soho & 15 Upper S^{T} Martinslane, London'. Large and Pontifex have unexpected relationships with the Phenakistiscope. Both are copper-plate makers (not engravers). They prepared the metal that engravers used for their engravings (Sung 2009: 119-134).[39]

This opens another level of production below the publishers. Phillips, Ackermann, and Pearson also needed to outsource tasks to engravers and plate makers. We are fortunate that we may credit the Phenakistiscope designs to Madou, Bury, and Thomas Mann Baynes. Using these plates, we may also credit production of copper to Thomas Large Jr. or Russell Pontifex & Son. The Thaumatropes, Myrioramas, and Copper-Plate Sliders would have required engraved plates of this sort, but none have ever been found for these other curiosities, effacing their material production and a network of enabling practitioners.

All of these novelty devices emerged during a key moment in the expansion of domestic media in the 1820s. This occurred through broader enabling paradigms. In order to fully understand the emerging media, we need to trace the different practical and conceptual infrastructures operating around them. Carpenter's practice has previously been taken as a series of isolated innovations, but there are many factors that underpinned and enabled it.

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[39] The existence of both Large and Pontifex stamps is confusing given that they both seem to do the same job. It is also very difficult to date the plates from the named businesses. Thomas Large Jr. died in 1827, six years before the Phenakistiscope. He was succeeded by his wife, Jane Large, who mostly traded under her own name. It is possible that Thomas's name continued to be used after his death (Mary Carpenter did this with the Philip Carpenter business between 1833 and 1836); or a Thomas Large plate may have been reused by Pontifex (some of the other matrices have faint markings earlier engravings on the reverse—reuse and correction are key parts of the engraving process, Sung 2009). Russell Pontifex is similarly difficult to pin down. Different iterations of Russell Pontifex & Son operated between 1830-1834, 1860-1868, and 1886-1892 (each a different Russell Pontifex). Edwin Pearson is most known for his work in the 1860s and 1870s, when he was a collector and publisher of Bewick. It seems most likely that these engravings are for later Phenakistiscopes, made by one of the later Russell Pontifexes on a reused Large plate, perhaps sometime in the 1860s (*British Artists' Suppliers*).

We can use information on the Phantasmagoria Lantern, Thaumatrope, Myriorama, and Phenakistiscope to build a structural history that can provide explanations for the expanding trade. We must do away with the myth of the heroic inventor and instead build a more subtle history of tangled causes and structures; of many instruments and ideas all contributing to an abstract set of frameworks and practices. Media transformation was in the air. A new structural potentials were being opened by growing manufacturing capabilities and retail markets. Philip Carpenter, Charles Blunt, John Paris, William Phillips, Rudolph Ackermann, Charles Schmalcalder, Thomas Talbot Bury, Thomas Large Jr., Russell Pontifex, and many other people besides, were all responding to these new conditions.



Figure 45.
Phantasmascope disc, 1833-1838.
National Science and Media Museum,
Ref: 1952-127/2.
Death's Head; published by Ackermann &
Co., after a design by Jean-Baptiste Madou.



Figure 46.
Set of Fantascope discs in a cardboard folder,
1833-1838. National Science and Media
Museum, Ref: 1954-329/1.
Published by Ackermann & Co.; designs by
Thomas Talbot Bury.



Figure 47.
Phenakistiscope disc, 1833-1838.
Cinémathèque Française, Ref: AP-94-257.
Giotto di Bondone; published by S.W. Fores.

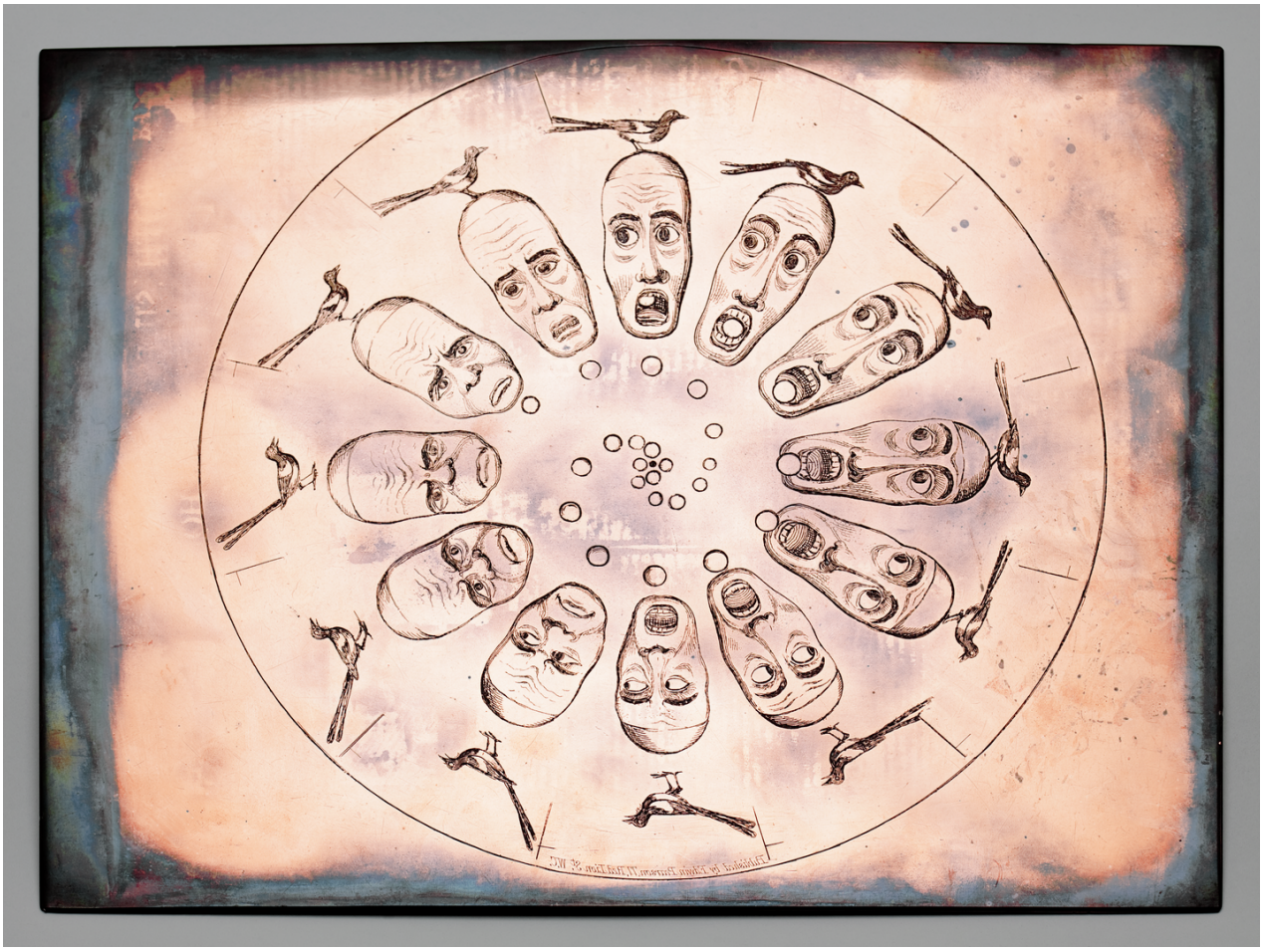





Figure 48.
Matrix for a Phenakistiscope disc, 1833-1892. National Science and Media Museum, Ref: 1954-331/1
Copperplate matrix for a Phenakistiscope disc illustrating Giotto di Bondone. Copper plate by Russell Pontifex & Son, or Thomas Large Jr., for a Phenakistiscope published by Edwin Pearson.

Details show maker's marks on front (shown mirrored) and rear.

VII. The Painters

I have demonstrated that the claims made for the innovative nature of the Copper-Plate Sliders are dubious. Carpenter was not the first person to attempt automatic slide production and his transfer process had negligible effect on the wider trade. The sliders were printed from an engraved matrix, like the Phenakistiscopes, although these plates do not survive. They underwent substantial painting work, as I have shown. This suggests two obscured production infrastructures (printing and painting) that are integral to the existence of these slides. Carpenter only had the idea of adapting copper-plate printing to slide production. He was not directly responsible for manufacture. Beyond any intellectual credit we may give to Carpenter, the Copper-Plate Sliders were products of extensive networks of printing and painting expertise. The people and practices responsible for producing the sliders are almost never addressed in the wider literature.

It is not clear who designed and manufactured the copper plates, although I have demonstrated that they were derived from pre-existing designs in earlier books and picture card sets. Additional painting added to the printed outlines by artists means that Carpenter's slides were just as indebted to miniature painters as other manufacturers' outputs. Very little is known about the people who painted the slides, but there are several names that emerge from the documentary record.

Harrison's history of the lantern mentions seven famous slide painters by name (1887: 804), all working for Carpenter, but many also embedded in other lantern frameworks. One painter, Charles Simpson, is also mentioned in Mary Carpenter's biography (R.L. Carpenter 1878: 51). Beattie has discovered information about three further slide painters working for Carpenter & Westley later in the century (2013: 9-10). Slide painting is a difficult activity to trace, given the lowly status of many practitioners, often considered only slide colourists. The names of the painters that have survived are among the most illustrious that Carpenter employed. He doubtless also outsourced to more humble colouring workshops.

> Among the best slide painters he employed may be mentioned Thomas Kearnan, the best slide painter of architectural subjects that ever lived; he died in 1872. Another was Henry Childe, who claimed the invention of dissolving views; he was clever at scenic effects, such as rippling water, summer and winter, eclipses at sea, and so on. Another was S.H. Baker, the best man who ever painted landscapes on glass for the lantern. J. Smith and Thomas Clare were other noted slide painters of

> the past, so also was Charles Simpson, a miniature and portrait painter by profession, who subsequently became blind. Lastly, C. Constant, the painter of comic slides, should be remembered; he has made himself immortal by devising the world-wide famous slide of the sleeping man swallowing endless processions of rats. (Harrison 1887: 804; fig. 49)

These men were established artists and Harrison mentions them to prove the prestige and quality of Carpenter's output.[40] They may have painted only the more expensive 'superior sliders'. The early zoology subjects and royal portraits would likely have been done by minor colourists.

These named artists were all professional painters of high standing, who worked on slides and miniatures as part of a varied portfolio. Kearnan was a printmaker, watercolorist, and engraver, who had exhibited work at the Royal Scottish Academy (*Art-Union* 1841: 83). Samuel Henry Baker was a successful landscape painter and member of the Royal Birmingham Society of Artists (Bury 2012: 72; Morris and Morris 1974: 4). He was taught to paint by a slide painter called James Chaplain (Scott 2000: 1; Wallis and Chamberlain 1892: 15), a jobbing painter of less renown (and an earlier slide painter for Carpenter). Clare was a landscape painter and slide painter for the Royal Polytechnic Institution (Robinson, Herbert and Crangle 2001: 72). Simpson was a professional miniaturist who had exhibited at the Royal Academy and British Institute. He was appointed painter to the Queen of Portugal (Robinson, Herbert and Crangle 2001: 279) and later, after going blind, was provided a pension by Mary Carpenter (R.L. Carpenter 1878 51). Childe became one of the most famous of all lantern practitioners. He was a slide painter, exhibiter, and pioneer of dissolving views (Robinson, Herbert and Crangle 2001: 65).

With the exception of Childe, all of these painters were best known for work outside the lantern trade—Kearnan and Baker have paintings and prints in national collections. Childe is one of the few slide painters commonly known by name. Examples of his slides for the Royal Polytechnic survive in the Media Museum and the Museum of the History of Science. The role of these men for Carpenter & Westley was likely as prestige artists for expensive orders outside of their normal slide output. R.L. Carpenter mentions a big order for a gas-lit, wheeled Phantasmagoria lantern for R.V. Yates' lectures at the Liverpool Mechanics' Institute: 'There were about 300 slides,

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[40] However, as Zillah Scott shows, the modern conception of the artist as a renowned image maker solidified only in the second half of the century (2000: 4-5). Prior to that there was considerable overlap with artisanal practices, with painters regarded as tradespeople. Carpenter's early slide output may have used the likes of Baker and Childe, but they would surely have handed the work to apprentices or lower painters as their reputations grew. By 1887, Harrison was projecting contemporary artistic prestige onto an earlier craft context.

views, &c., to be executed in the best manner. The cost between £100 and £200' (1878: 51). This was apparently not exceptional: 'Since that time the art of slide-painting has been carried to great perfection, and lanterns with dissolving views have been sold to clergymen for more than £600' (1878: 51). High-value sales called for the best painters; it is likely that these artists would have been reserved for bespoke orders.

A set of sample paintings from Carpenter & Westley's Regent Street shop survives in the Museo Nazionale del Cinema. These were used to demonstrate the best quality slide paintings available. They confirm the use of artists to produce views to order (figs 50 and 51). They show famous slide subjects—boiling springs, the burning prairie, Holyrood Chapel, etc.—painted in detail above all but the very best slides.

The lower class of slide painters is far more difficult to identify, but one minor figure among Carpenter & Westley's slide painters has been fortuitously unearthed by Beattie:

> Joseph Harris, who lived in Tonbridge. In the 1881 census, aged 67, he was clearly so proud of his history that he made the census enumerator take up two lines for his occupation (something not normally done), which is given as 'optical slide painter for messrs Carpenter & Westley'. Joseph started as a painter of Tonbridge ware. He lived with his brother and father, both of whom were artists. By 1851 his brother had started painting slides and by 1861 Joseph was doing so as well. He never married and died in 1886, aged 73. (2013: 10)

This shows that Carpenter & Westley were outsourcing to a dispersed network of painters. Harris was located in Tonbridge, Kent, some distance south of the Regent Street business and an area with a strong network of professional painters and colourists. Tonbridge ware, which Harris started his career painting, were decorative inlaid wooden boxes made in a localised network of workshops (Austen 2001). Harris probably worked as a colourist, or as a painter of more detailed patterns. As was fairly typical, he could have moved between trades seamlessly. He possessed a skillset that made him proficient in the manufacture of numerous kinds of painted goods and would have varied his output to guard against periods of lesser demand. This was common to all outworkers in the eighteenth and nineteenth centuries.

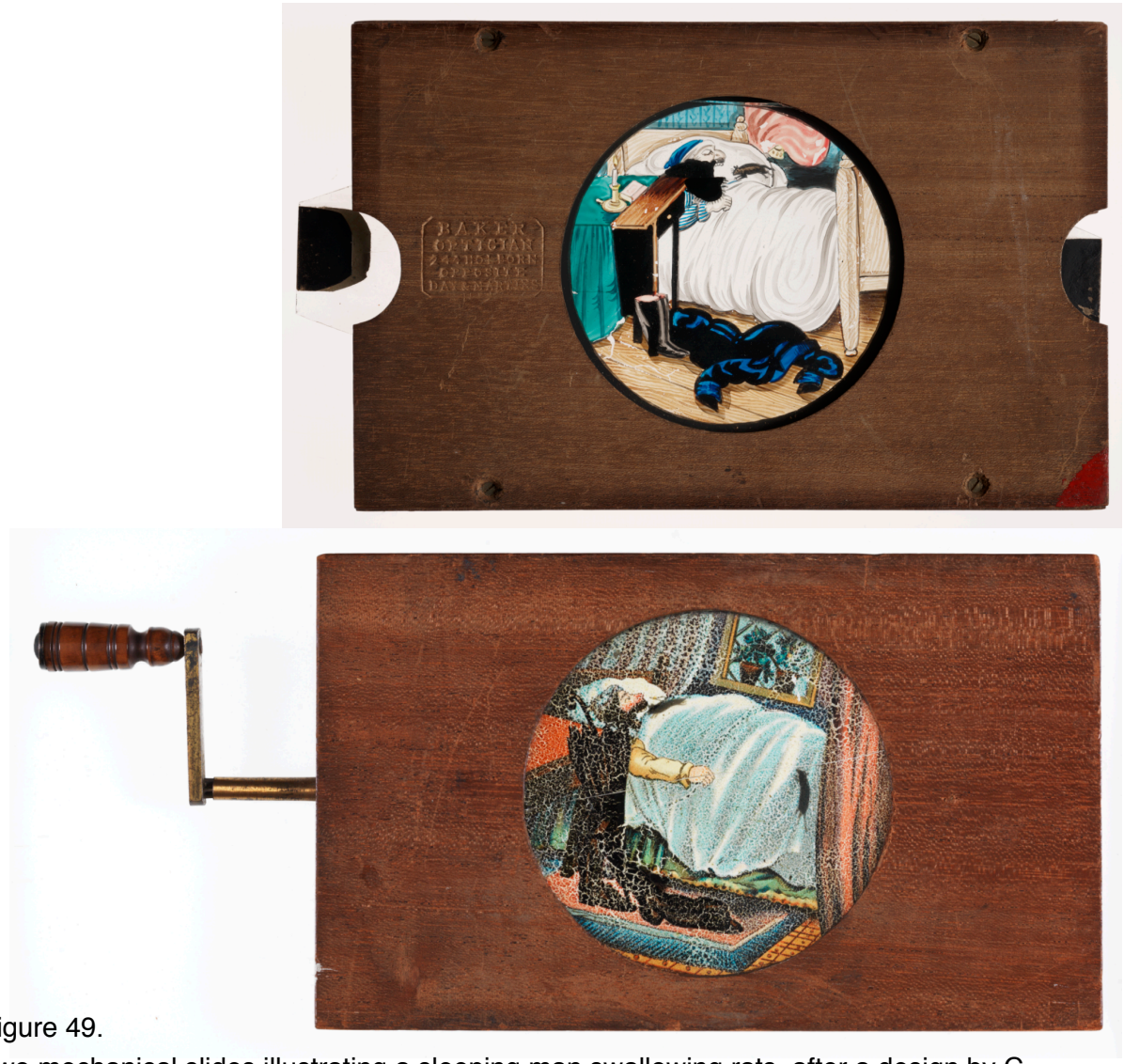

Figure 49.
Two mechanical slides illustrating a sleeping man swallowing rats, after a design by C. Constant.

Slipping slide by Charles Baker, 1871-1891.
National Science and Media Museum, Ref: 1990-5036/11457.
The moving glass slippers animate the man's jaw and the moving rat, which runs across the bed covers and into his mouth.

Rackwork slide by an unknown maker, 1830-1880.
National Science and Media Museum, Ref: 1990-5036/13251.
The rackwork mechanism rotates a second glass with rats painted on it. There is a masking that obscures the rats at the bottom and left hand of the image. The rat runs a circular course up the bed covers and into the man's mouth, where it disappears.

This is one of the most famous of all slide subjects. A later account by H.W. Whanshaw recalls the rat swallower:

> The high spot of the whole entertainment—the gentleman in bed who swallowed the rats. He was our star turn, our living picture, our cinema. He was everything. He made up for all the long, and sometimes dreary lectures to which we had to listen, even though it was accompanied by 'dissolving views.' We wanted life and movement, and when he was thrown on the screen the grand climax of the whole entertainment had been reached, and enjoyment was complete. (1950; cited in Robinson, Herbert and Crangle 2001: 76).



Figure 50.
Sample paintings from Carpenter & Westley's Regent Street shop, 1836-1880.
Museo Nazionale del Cinema, Ref: M02747.









Figure 51.

Detail from sample board, showing a burning prairie, after an engraving by Josiah Wood Whymper, and three lantern slides of the same image.

Prairie on Fire, by Carpenter & Westley, 1836-1880. National Science and Media Museum, Ref: 1951-312/11.

Prairie on Fire, by Newton & Co., 1851-1900. Bill Douglas Museum, Ref: 64075.

Prairie on Fire, by an unknown slide maker, 1830-1880. Phillip Roberts collection.

VIII. The Enamelers

Other trades supported networks of outworkers elsewhere in the country, and these too could have supplied skilled painters to the lantern trade. In Carpenter's Birmingham, a huge range of products were put out by different trade networks. Two further slide painters raised by Beattie, James and Edwin Chaplain, were embedded in this manufacturing landscape:

> James Chaplain, whose father was also a slide painter. Edwin, James's younger brother was a japanner as well as a slide painter for the rival Birmingham optician Robert Field. (2013: 10)

This is the same James Chaplain that first trained Baker (Scott 2000: 1). That Edwin Chaplain was a japanner shows that Carpenter was utilising expertise tied to the broader manufacturing landscape in Birmingham. This makes sense, given the city's longstanding production infrastructure.

The availability of skilled painters, colourists, and miniaturists helped Carpenter to efficiently turn out slides. Further, the broader trade networks of jobbing artists provide a more compelling explanation for his use of the copper-plate transfer process. We have seen how this process allowed him to claim a discourse of innovation that was at odds with its actual originality and usefulness. But the feasibility of the process was enabled by the existence of a wide network of copper-plate printers scattered about him. These were not the printmakers, whose engraving and printing skills were of limited use for glass, but the enamelers.

In Bilston, at the southern edge of Wolverhampton, and drawing on dispersed trade infrastructures that stretched across the Black Country to Birmingham, the enamelers produced all manner of fancy copper pots, bonbonnières, and snuff boxes (fig. 52). These were highly decorative. Many were shaped as birds, frogs, or other animals. They were beautifully coloured, with elegant polished metal clasps and hinges. The pots were hand-painted, but more detailed scenes and patterns could be added using a copper-plate transfer process. These were applied in the same manner as the Sadler and Green tiles and the Copper-Plate Sliders.

Most scholars presume that Carpenter's slides were printed using ink, like a paper print, but the enamelers and copper-plate printers used glue and a fine powder. In 1766, Sophia Petty described the transfer process during a visit to John Taylor's Union Street toy works in Birmingham, a factory making enamelware boxes, buttons, buckles, and other trinkets:

> The method of doing it is this: a stamping instrument managed only by one woman first impresses the picture on paper, which paper is then laid even upon a piece of white enamel and rubbed hard with a knife, or instrument like it, till it is marked upon the box. Then there is spread over it with a brush some metallic colour reduced to a fine powder which adheres to the moist part and, by putting it afterwards into an oven for a few minutes, the whole is completed by fixing the colour. (Fitzmaurice 1875: 401)

Examination of surviving slides confirms that the Copper-Plate Sliders were made using the same method (fig. 27). Hecht considered the Sadler and Green tiles as a key precedent to Carpenter's transfer process because they were the most famous instance of copper-plate transfers on non-porous surfaces, but it is far more likely that he looked to the local Birmingham trades.

It was not just a matter of adapting an idea. Carpenter needed available expertise to make a slide-transfer process commercially viable. We are not looking for intellectual antecedents, but for tradespeople capable of carrying an idea into actuality. A practice-oriented approach demands a different conception of invention entirely. There was already a trade infrastructure that laid the groundwork for the emergence of the new sliders. To claim invention for Carpenter or, if we prefer, for John Sadler, or John Brooks, is to overvalue those people with the capital or influence to actualise long-existing potentials. The Copper-Plate Sliders were impossible without the enamelers, printers, painters, and skilled toymakers.

All technical innovation requires an enabling social frame (Bijker 1995, 2012 [1987]), or practical and intellectual precedent (Berg 2002). Even Brooks, who scholars credit with developing enamel transfer printing, may only have brought these techniques to patent. Berg acknowledged the slippery nature of Brooks' priority:

> His patent applications for 'a method of printing upon enamel and china from engraved, etched or mezzotinto plates' all failed. His process had a context—the Birmingham toy trades, another new luxury trade. Transfer-printed japanned goods had been available for some years. (2005: 136)

The height of business for decorative enamelware was the middle of the eighteenth century. It was in decline by the end of the century, and many enamelers moved into other trades, becoming japanners, or jobbing painters, or colourists. By the time Carpenter released the Copper-Plate Sliders there were fewer skilled enamelers, but still an extant trade structure across the japanning and toy trades that he could call upon. Painters like Edwin Chaplain straddled trade boundaries, utilising their skills in

any way that would earn an income. Most of these outworkers cannot be identified, but their manufacturing footprint remains in the surviving material evidence. We see an index of Chaplain's work in the garish royal portraits of Carpenter's early sliders.



Figure 52.
Two decorative enamelled bonbonnières, shaped like birds.
Copper base, shaped and glazed, transfer-printed and then hand-painted.
Magpie bonbonnière, 1760-1780. Birmingham Museums Trust, Ref: 1962M74.5.
Parrot bonbonnière, 1760-1780. Birmingham Museums Trust, Ref: 1962M74.8.

IX. Towards A Structural History of Media

The Phantasmagoria Lantern should be viewed in the context of other early media devices emerging over the 1810s, 1820s, and 1830s. These instruments and toys should make us wary of the media scholar's predilection for separating each trade's history, such that we have instrument, publishing, lantern, and moving picture scholars isolating individual instruments. Each trade had its own internal practices, traditions, and dynamics, but there was also significant overlap between them. It is doubtful that consumers would make much practical distinction between lanterns, paper toys, and novelty products. The foundations of the lantern trade were laid out in the context of these other products and retail innovations.

And so the lantern trade emerged. Not all at once, but in little pieces, as retailers of all kinds turned out domestic and novelty products. The new curiosities, instruments, and visual trifles were drawn together as new commodities. These were the first glimmers of a formal market for domestic media. Of all these devices, the magic lantern enjoyed the most sustained success. It was more flexible in its use than the paper toys, because of its varied slide subjects and its integration into the public entertainment landscape.

A closer look at the retailers around Carpenter shows that he was not so exceptional as has been thought. We can predate some practices and attribute others to wider networks of professional expertise. This does not diminish his importance, it just reframes his contributions in a more complex commercial landscape. His huge documentary and material footprint offers an unusually detailed case study. We can use this to ascertain common and exceptional trade practices that we can refer to smaller instrument makers and other contemporaries. But the evidence on Carpenter, reconsidered in the context of a wider field of retail and manufacturing practice, should make us uneasy. His reputation was conferred only because of the lack of evidence on other practitioners. His business relies on the enabling infrastructures around him. It points towards the work of anonymous labourers that left little mark on the historical record. It is clear that the painters and transfer printers contributed their skills to the production of the Copper-Plate Sliders. It is their expertise that enables Carpenter's marketing discourse and his subsequent reputation as an innovator.

Media history requires methodologies to deal with this problem. I have already suggested methods to deal with the ephemerality of the lantern, but the anonymous workshop networks that plugged into the shops and factories of the larger instrument makers requires that we go further. I propose a structural history of media production.

Over the next few chapters, I will explore the production infrastructures that produced the Phantasmagoria Lanterns and early media instruments. This will present a major cause of the nascent lantern trade. New products were emerging and new retail networks were unfolding, but all of this was underpinned by new manufacturing potentials in an enveloping infrastructure of workshops, foundries, and factories. Research on infrastructure requires greater attentiveness to the problem of evidential survival. I will use the existing material and documentary evidence to establish the practices of the instrument makers and their relationship with smaller labourers. This will unveil a structure of media production that has been little understood. We cannot know the lives of the thousands of anonymous workers, but we can know something of the networks and structures in which they lived and worked.

Chapter 5.

The Kaleidoscopes and its Makers

I. The First Optical Toy

The Kaleidoscope first appeared in 1817. It was released as a joint venture between Carpenter and David Brewster, four years before the Phantasmagoria Lantern, with Brewster supplying the concept and publicity, and Carpenter managing its manufacture and distribution. This was not the first time that instrument makers had utilised optical principles to produce entertaining devices, but it was the first instance of an instrument marketed and consumed as a fashionable must-have object. Carpenter's involvement in the venture is important because it suggested many techniques that he would later repeat with his Phantasmagoria Lanterns. He embedded his production methods into the local manufacturing landscape, heavily marketed the device, and produced it in large numbers. For 1817, these were new practices, but they would become common to the exploitation of optical media in the popular market, and key practices in the emerging lantern trade.

In 1817 Birmingham became a site of experimentation for the future media trade. The instrument was devised as an interesting optical curiosity, like those that Scott had sold two decades earlier, but it went on to become a success of previously-unimaginable proportions, becoming the first great popular media craze. It was the first Viewmaster, Gameboy, or Tamagotchi. Its success was triggered by the rising output potentials of metal workers in the 1810s. It established strategies for exploiting optical technologies that were generated by the eccentric relationships of the Birmingham production economies. The Kaleidoscope set rules for high-production, wide-dissemination, brand-identification business practices that have persisted for 200 years, but these were only partially designed by its makers. Neither Carpenter nor Brewster were prepared for its popularity.

An early spike in interest motivated Carpenter to produce a large number of Kaleidoscopes to sell as off-the-shelf novelties, which triggered a feedback loop between growing popularity and greater production. The unprecedented capability of the Birmingham metalworkers at this moment, at the tail of the first industrial revolution, meant that more Kaleidoscopes could be produced than any prior instrument. The brass tube makers turned out a fantastic number of Kaleidoscopes until, by the middle of 1818, even they could not supply the ballooning market. Other instrument makers, and other metalworking regions, were called upon to meet demand.

This chapter will tell the story of the Kaleidoscope mania as it swept the country over these two years, demonstrating possible business models, striking new markets for popular media, and teaching Carpenter and his contemporaries how the magic lanterns, paper toys, and optical toys could be exploited over the coming years. Where other analyses have focused on the reception of the instrument (Groth 2007; Hutamo 2014; Bush 2015), I demonstrate the important interplay between the instrument's cultural life and its business history. Other scholars have taken its existence for granted, presuming a fully-designed commercial strategy and neglecting the feedback between reception and production. This account reveals new documentary and material findings and insert the instrument into its wider retail and manufacturing contexts. I show how the Kaleidoscope snowballed away from its makers and how further practitioners were required to control the unfolding commercial opportunities. Following James Beniger (1985; Roberts 2014), we can say that the accelerating production capabilities of the metal workers and instrument makers generated an output crisis, in which more instruments could be made than the market could support, requiring retail expansion, wider distribution, and new strategies of selling. New templates for popular media were discovered. Here I explore the events that led up to this. In the next chapter I will set the instrument in its broader commercial context in order to show how anonymous labour in the brass, glass, and toy trades contributed to the emergence of these new business models.

II. Optical Toys and Popular Science

> 'What are you so busy about, Caroline?' said Alfred, peeping over his sister's shoulder one morning and examining some little bits of amber, lace, spar, and glass, which she was sorting from among a larger collection, and placing in a small paper tray. 'What are you going to do with all those little things?—bits of amber, and little shells, and dragon-

> flies' wings, and glass beads and pink bugles—what can you be about, Caroline?'
>
> 'You know very well what a kaleidoscope is, I believe', replied his sister, 'well, papa is making one, and these little *morceaux* which excite your curiosity so much are to be put into it'. (*The Youth's Sketch Book* 1834: 158).

In 1834, a Kaleidoscope was featured in *The Youth's Sketch Book*, a compendium of educational stories and poems. Caroline and Alfred's father is building a Kaleidoscope for them to enjoy, and to help them learn about optics. 'A kaleidoscope! a kaleidoscope! exclaimed Alfred, in a tone of delight, 'is my dear papa really making a kaleidoscope?—the very thing of all things that I should like to see!' (1834: 159). The story emphasises the wonder inherent in the little instrument, presenting Alfred's excitement and curiosity about its beautiful patterns. It sets out, through dialogue between Alfred and his father, to explain the phenomena that he sees. The story uses the child's perspective to describe the instrument from a point of uncomprehending awe, contrasted to the father's enlightened perspective, which outlines its construction and principles.

> This triangular glass is a very common optical instrument called a *prism.* By fixing this prism in a tin tube, for the sake of convenience, and placing the little glass box that contains the beads, and bugles, and bits of glass, which Caroline has been sorting, at the bottom of the tube, we shall have a perfect kaleidoscope.
>
> Thus you see that causes perfectly simple in themselves often produce effects which, to the uninformed, appear most extraordinary. (1834: 163)

Seventeen years after the first appearance of the Kaleidoscope (and describing a rather atypical version), *The Youth's Sketch Book* presents a number of commentaries on the scientific basis of everyday phenomena. It is fascinated by tricks, games, and beautiful sights, but also sets these interesting things in a moral and educational discourse.

Optical and philosophical toys were first integrated into the practice of the instrument maker and popular scientist as a means of demonstrating particular scientific principles. As we have seen, they were quickly taken up by manufacturers and publishers, who utilised their skillsets and trade connections to produce commodified toys for the popular market. These toys could be scaled-down versions of earlier scientific instruments, or newly invented devices that could be sold as intellectually stimulating. There was much popular interest in science in the early

nineteenth century, as shown by many books and periodicals intended to teach scientific principles in entertaining or accessible ways (Lightman 1997, 2007: 295-352). We have seen how Paris presented scientific ideas through children's toys and games. Similarly, Brewster's *Treatise on Optics* (1833) categorises different optical principles and suggests how these are exemplified by different instruments, while his *Letters on Natural Magic* (1832) provides modern scientific explanations for natural wonders and stories from antiquity. Popular instructive books by Elizabeth Somerville (1803), J.L. Blake (1823), Frederick Bakewell (1833), Charles Blunt (1840), Linney Gilbert (1846), Dionysius Lardner (1855), and J.H. Pepper (1869) put scientific learning in various educational, rational, moral, and wondrous discursive contexts. This continued throughout the century, intersecting and tangling about the markets for popular and domestic media.

Many optical toys were invested with the same principles of popular education that Carpenter conjured with the Phantasmagoria Lantern. There are many treatises and advertisements that praise the intellectual worth of these small mechanical trinkets. Optical toys were exciting because of their dual status as sources of spectacle and demonstrations of optics. Drawing on an older conception of science as akin to wonderment (Daston and Park 2001; Stafford 1994), these toys presented magical spectacles that could shock or delight. But, through the supporting literature and surrounding marketing discourse, this magic was explained, so that the toy became an indicator of attained scientific knowledge. These instruments were amusement and instruction combined and it is this duplicity that the instrument makers tried to capture. Retailers exploited the respectability of scientific education to justify games and spectacles, but, at the same time, they used the popular appeal of spectacle (and tricks, jokes, games, etc.) to propel scientific instruments into a popular market.

III. What was a Kaleidoscope?

Modern Kaleidoscopes are little changed from the earliest versions. Carpenter's instrument (fig. 53) consisted of a cylindrical tube fitted with inclined mirrors to reflect shapes into infinite patterns. Brewster claims to have invented it in 1814, having come across the idea of playing with inclined reflections during his research on polarisation (1819: 1), although the kaleidoscopic principle had been known since at least 1710 (Hecht 1993: 72-73). He was awarded a patent in 1817 and went into production soon after, with Carpenter as sole maker.

Early Kaleidoscopes are all similar in design, but may have two functions. They could be fitted with an object cell (filled with coloured stones and fragments), or a lens

(fig. 54). The latter was used to view external objects, like a telescope, but reflected into kaleidoscopic patterns. They were sold with and without object cells. In *A Treatise on the Kaleidoscope* Brewster explains how he had first designed a version with permanently fixed coloured glasses, which was pleasing, but produced no sustained interest. He added means of rotating and interchanging the objects, which gave variability to the patterns, and, later, a draw tube and convex lens to allow viewing of external objects; so that, as Brewster says:

> The images of objects, of all magnitudes and at all distances, might be distinctly formed at the end of the reflectors, and introduced into the pictures created by the instrument in the same manner as if they had been reduced in size and placed in the true position of symmetry. (1819: 6)

These versions were called telescopic Kaleidoscopes and are not commonly known today. They follow the same principle as a pocket draw-telescope, with lens, and sliding mechanism to focus, but fitted with inclined mirrors.

Carpenter sold both, each fitted with two mirrors. Brewster calls these versions 'simple kaleidoscopes' (1819: 56). The Media Museum has an early telescopic Kaleidoscope with a stamp identifying Carpenter as sole maker (fig. 53). This suggests that this example is from 1817 or 1818, and is one of the original versions of the instrument.[41] This early Kaleidoscope is made from two brass tubes (one with black japanned lacquering) with additional brass fixings and stamped end-pieces. The internal mirrors are permanently fixed with glue and wood, and the whole instrument is stored in a cardboard tube. A small convex lens (missing in this example) would have fitted into one of the brass fixings and slid onto the end of the instrument. This is an extremely simple and efficient design, one of the main reasons for the success of the instrument and its subsequent impact on optical media retail. I will return to this point shortly.

The standard Kaleidoscope, with object cells, followed this design closely, as we see from a later example in the Science Museum (fig. 55). This Kaleidoscope bears a Carpenter & Westley stamp, indicating that it is from after 1836. It comes with a mahogany storage box and various object cells, but is otherwise very similar to the

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[41] Carpenter was only installed as sole maker for one year, before Brewster extended production rights to others. By 1819, he was no longer sole maker. It is possible that he continued to describe himself as such after this date, meaning that this example could have been made a little later. Carpenter's letterhead, shown on an 1824 receipt (fig. 71), continues to identify him as 'sole maker of Dr Brewster's Patent Kaleidoscope' four years after the fact. There are other sole-maker Kaleidoscopes in the Bill Douglas Museum and National Museum of Scotland.

1817 version. What is interesting here is that the instrument has been collected into a tidy package for consumer retail. The box is velvet lined, comes with a lock and key, and the kaleidoscope has been silver plated. These touches are superfluous to the functioning of the instrument, but serve to add prestige value. Brewster's published writings on the Kaleidoscope take great care in explaining the scientific merits and practical application of his invention, but this package screams of luxury consumption.

Brewster's framing discourse is evident in his patent specification, which praises the professional applications of the device:

> It will be of great use to architects, ornamental painters, plasterers, jewellers, carvers and gilders, cabinet makers, wire workers, book binders, calico printers, carpet manufacturers, manufacturers of pottery, and every other profession in which ornamental patterns are required. ('Cabinet of Varieties' 1817 [1818]: 40-41)

But it is doubtful if the Kaleidoscope was ever much appreciated as a professional instrument. One commentator said that 'no invention, perhaps, ever excited more general attention among all classes of people, than the Kaleidoscope', but also that it 'serves more as a toy than to any serious purpose' ('The Most Important Inventions and Discoveries of our Times' 1819: 19).

Elsewhere, *The Literary Panorama* presents a curious gentleman captivated by his Kaleidoscope:

> You see, sir, that beautiful star in the centre; that graceful red line down the middle which closely resembles the order of—Then such mountains of gold and silver! there, sir, hold it in that direction, while I just turn the —O! how beautiful! what a happy combination! all the hues of the rainbow! and pray look round the edges; what a delightful series of— yes, sir this is the true—the patent—the invaluable Kaleidoscope! ('Political Periscope' 1818: 503)

The instrument is rarely discussed in terms of its practical scientific uses. Here it is a source of fleeting spectacle. The article describes the Kaleidoscope as an instrument of deception, reflecting the outside world as illusory abstract beauty.

An 1818 illustration by Damian Klex shows a man with a kaleidoscope being hit by a bicycle (fig. 56). He is so captured by infinite kaleidoscopic visions that he has not noticed an advancing cyclist. Both Kaleidoscope and bicycle (an early Draisine or hobby horse, invented in 1817) were indicators of modernity and its many startling

novelties. An accompanying article by Eduard Anschütz provided an interpretive commentary on the illustration:

> The stout gentleman is absorbed in the contemplation of the kaleidoscope's wonderful play of colours—the dark glass makes him even more nearsighted than usual. He is about to be knocked to the ground by a passionate draisine rider, who likewise has his eye fixed only on his machine. Let this be a warning for others. There is already supposed to be a police order in the works on the strength of which every blockhead is strictly forbidden, on account of the danger, from using both new inventions. (Steblin 2014: 8-9, 1998: 335-336)

As Huhtamo (2014) and Nicole Garrod Bush (2015) show, there are many visual and literary articulations of kaleidoscopism that are concerned with the instrument's beauty, deceptiveness, newness, or pointlessness. There are few dealing with its contribution to optical science. The Kaleidoscope's popularity was a result of its pleasing spectacles; its scientific content was presented as a supplementary appeal to educational or practical value, so as to render it respectable.

But this was no empty spectacle. The Kaleidoscope allowed users to manipulate the concrete world and explore perception in ways rarely possible before. Its newness is reflected by a strange analogous description given in Brewster's patent specification: 'The Kaleidoscope therefore seems to realise the idea of an ocular harpsichord' ('Cabinet of Varieties' 1817: 41). This exploration of new powers of vision contributed to popular consumption of other optical instruments, such as the microscope and telescope, which similarly played with the practice of visibility (Crary 1990; Flint 2000; Wade 2004a; Groth 2007). That the Kaleidoscope was relatively cheap (for a middle-class purchaser) and widely counterfeited (Brewster 1818: 148; Morrison-Low 2007: 224-225; Correia 2016: 3-4) contributed to its success, making it the first popular optical media instrument. It offered a new way of interacting with the world.





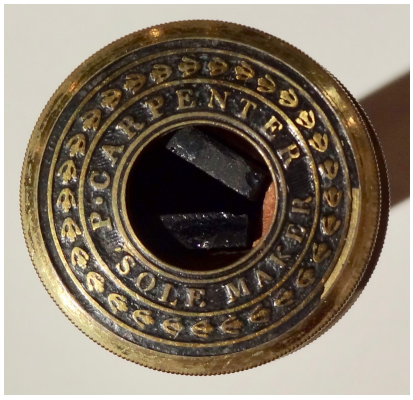



Figure 53.
Brewster's Patent Kaleidoscope, 1817-1818.
National Science and Media Museum, Ref: 1990-5036/4606.

Simple Kaleidoscope in cardboard tube [without lens or object cells], by Philip Carpenter.

Details show individual parts: brass tubes (one japanned), brass fixing, and stamped brass details on ends.



Figure 54.
Object cells and lenses for Brewster's Patent Kaleidoscope, 1817-1830.
National Museums Scotland

Object cells and lenses for a simple Kaleidoscope, in cardboard tube, by an unknown maker [likely Philip Carpenter].

Object cells contain coloured stones and shapes, to create random patterns.





Figure 55.
Brewster's Patent Kaleidoscope, 1836-1850.
Science Museum, Ref: 1918-112.

Simple Kaleidoscope in box, by Carpenter & Westley

Details show variant stamped detail. The ribbon now says: Carpenter & Westley.



Figure 56.
From *Archiv des menschlichen Unsinns,* 1818. Wienbibliothek.

Watercolour by Leopold Kupelwieser (aka Damian Klex), illustrating a man absorbed in his kaleidoscope being hit by an early Draisine bicycle.

IV. The First Media Craze

Brewster claimed that 200,000 Kaleidoscopes (both Patent Kaleidoscopes and counterfeit copies) were sold in three months (1819: 7). It is impossible to verify this number, but the extensive critical furore over the device (Bush 2015) shows that it was a great success. William Pulleyn's *Etymological Compendium* says that 'the novelty was so enchanting that opticians could not manufacture Kaleidoscopes fast enough to meet the universal desire for seeing the delightful and ever-varying combinations presented by each turn of the magical cylinder' (1830: 49). The *Philosophical Magazine* said the instrument was 'now in the hands of almost every person' ('On the Kaleidoscope' 1818: 376). Brewster, in a moment of shameless self-promotion, claimed:

> In the memory of man no invention, and no work, whether addressed to the imagination or to the understanding, ever produced such an effect. A Universal mania for the instrument seized all classes, from the lowest to the highest, from the most ignorant to the most learned, and every person not only felt, but expressed the feeling, that a new pleasure had been added to their existence.[42] (1818: 159)

By 1818, Carpenter could no longer meet production demands and several other manufacturers were granted permission to manufacture the device. An advertisement shows that official Brewster-approved Kaleidoscopes were now manufactured by seventeen instrument makers including Carpenter, Schmalcalder, the Dollonds, the Joneses, R.B. Bate, Thomas Harris, Egerton Smith, Thomas Blunt, and John Ruthven (ScM 1951-687/18; fig 57). The majority of these new manufacturers were situated in London, but the contracting of manufacturers in Edinburgh, Liverpool, and Bristol (and retaining Carpenter in Birmingham) gives some indication of the instrument's popular appeal across the country.

The Kaleidoscope was the first popular craze in media history. The newness of the kaleidoscope became something to exploit, and this worked to such an extent that sources talk of a 'mania' for the device (Correia 2016: 5; Political Periscope 1818: 503). At the beginning of the nineteenth century, instrument makers were confronted with an expanding market for luxury goods that encouraged them to sell increasing numbers of

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[42] This article was initially credited to the optician R.B. Bate, who later contacted the *Repertory of Arts* asking for it to be amended to Brewster, because he did not write it (1818: 256). It seems that Brewster wrote the article as a false third-person account of his invention, using Bate's name to give it objective authority.

off-the-shelf objects, intended for novelty rather than experimental use (Morrison-Low 2007: 271-274). Scientific instruments were increasingly sold as consumer objects; as Berg suggests, 'ornaments of consumption as much as they were tools of engineering' (1998: 154). Scholars have described this age of expanding luxury retail in the eighteenth and nineteenth centuries as a consumer revolution (Berg 2004, 2005). At this retail moment, Carpenter and his contemporaries moved to capture a growing market, selling microscopes, telescopes, looking-glasses, and other domestic instruments.

With the success of the Kaleidoscope in 1817, this potential market crystallised into an emerging market for optical novelties. Its enormous success suggested a new way of selling instruments. The Phantasmagoria Lantern also targeted this market, as we have seen. In the context of Carpenter's involvement with the Kaleidoscope, it becomes more obvious that the key drivers of success for early domestic media were the ability to market them effectively and the capacity to produce them in large numbers. They were not successful only for their inventive features. Neither instrument heralded any industrial or commercial innovations. But both the Kaleidoscope and Phantasmagoria Lantern were well-integrated into the local workshop economy. This helped Carpenter to produce large numbers of each (contributing to their wide dissemination). He utilised the increasing output potentials of manufacturing infrastructures. As I will show in the following chapter, the expansion of the lantern trade at this moment was driven by these external economic and manufacturing structures.

V. Different Versions

But there was also significant variation within the Kaleidoscope paradigm. The Kaleidoscopes were not uniform in style, but varied according to the requirements of each maker. R.B. Bate's tripod-mounted Polyangular Kaleidoscope (Brewster 1819: 79-88; fig. 58), intended as a tool for drawing patterns, was the most unusual. Others were broadly similar in format, but differed in finish, arrangement of mirrors, and luxuriousness of packaging. Kaleidoscopes were also given different names, to distinguish them in the marketplace. Carpenter produced simple and telescopic Kaleidoscopes; Dollond made Annular and Parallel Kaleidoscopes (Brewster 1819: 87-90; fig. 60); Ruthven's were called Universal Kaleidoscopes (Brewster 1819:

90-92).[43] Beneath the concept of kaleidoscopism, which captured the popular imagination and continues to appear as an indistinct instrument in the literature, was a more complicated sequence of minor difference, as the instrument was changed to fit the needs of makers and fill different niches. Like the lantern, the Kaleidoscope was never one thing—it was a continuum.

By 1818 there were seventeen approved versions of the instrument and countless spurious unauthorised versions. These were not simple copies; each Kaleidoscope, genuine and pirate versions alike, were made in different ways, with different features, to take best advantage of specific manufacturing and retail circumstances. Some pirates, unable to produce brass tubes and with no connections to the metalwork industries, produced cardboard Kaleidoscopes (like the paper toys, they suggest practices drawn from the printing and paper-making trades). Even among approved instruments, different makers produced unique variants suited to specific markets.

The Carpenter and Ruthven Kaleidoscopes were rooted in the new industrial cities (in Ruthven's case, not Birmingham, but Sheffield). Other versions did not follow the same patterns. Robert Brettell Bate produced a table-top variety for artists and draughtsmen. Bate was a well-regarded maker of hydrometers, saccharometers, weights and measures, and mathematical and philosophical instruments (McConnell 1993, 2004; Stevenson 2017). A trade card in the Science Museum emphasises his professional and occupational instruments (ScM 1951-687/3; fig. 59).

Bate's Kaleidoscope was of a different sort. Unlike the simpler Carpenter version, his Polyangular Kaleidoscope was a grand polished-brass instrument on a mounted stand (fig. 58). This version had adjustable reflectors and no lens or object cell. It reflected external views into kaleidoscopic patterns, as with the telescopic models. The Kaleidoscope was static, but, as Correia explains, 'it was the adjustability of the reflectors that allowed control of how the image was viewed within the aperture of the Bate which offered an alternative to the portability factor of the Carpenter' (2016: 5). It was framed as a practical instrument, intended to assist draughtsmen with drawing patterns. This was a different way of framing how users could interact with a

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[43] Variations were not confined to the authorised makers. *The Analectic Magazine* noted that 'the French are varying the Kaleidoscope in every possible mode. One artist announces the addition of *sentiment* to this *joujou,* which he names a *Policonoscope*, and fills with shade portraits of *dear beings*; another calls his the *Transfigurateur,* and furnishes bouquets, flower baskets, fruits, &c.' (1818: 349-350).

Kaleidoscope, which was suited to Bate's standing as a manufacturer of professional instruments.[44]

In *A Treatise on the Kaleidoscope* Brewster outlines the different available Kaleidoscopes; he discusses the simple and compound Kaleidoscopes, Bate's conical and cylindrical Polyangular Kaleidoscopes, Dollond's Annular and Parallel Kaleidoscope, Ruthven's Universal Kaleidoscope, and the Polycentral Kaleidoscopes. Each follows the same principle of reflecting objects in inclined mirrors, but differently apply this principle to practical use. He says that the Polyangular version should be used to view objects 'in the same manner as we view objects in the microscope' (1819: 63), conjuring an image of the user hunched over a desk, eye pressed to the lens, studiously copying patterns to paper. One of Brewster's expressed applications of the instrument was as an aid to drawing patterns for architecture, ornamental painting, and carpet design. He claims that 'it will create, in a single hour, what a thousand artists could not invent in the course of a year' (1819: 116). Each version is suited to a different application. The Bate Kaleidoscope is most suited to supporting artistic practice, due to its mounted design and ability to reflect objects at close proximity (1819: 124). Other versions are better utilised as instruments of amusement, as a means of illustrating optical principles, as portable devices, or for viewing landscapes.

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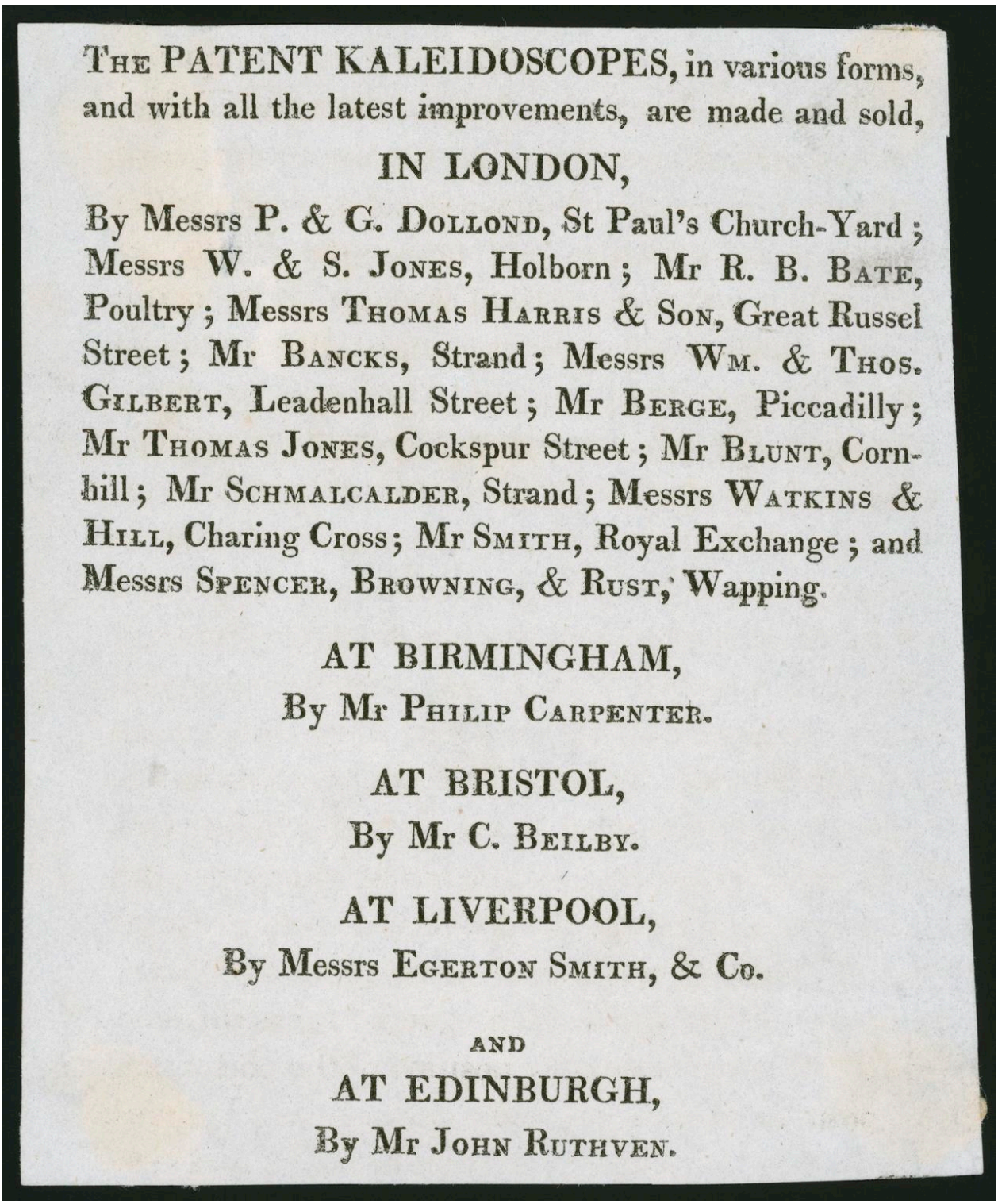
[44] Bate's Kaleidoscope also required an innovative tapered brass tube, only possible from 1813, following Henry Osborne's new technique for producing tapering cylinders (Aitken 1966 [1867]: 324).


THE PATENT KALEIDOSCOPES, in various forms, and with all the latest improvements, are made and sold,

IN LONDON,

By Messrs P. & G. DOLLOND, St Paul's Church-Yard; Messrs W. & S. JONES, Holborn; Mr R. B. BATE, Poultry; Messrs THOMAS HARRIS & SON, Great Russel Street; Mr BANCKS, Strand; Messrs WM. & THOS. GILBERT, Leadenhall Street; Mr BERGE, Piccadilly; Mr THOMAS JONES, Cockspur Street; Mr BLUNT, Cornhill; Mr SCHMALCALDER, Strand; Messrs WATKINS & HILL, Charing Cross; Mr SMITH, Royal Exchange; and Messrs SPENCER, BROWNING, & RUST, Wapping.

AT BIRMINGHAM,

By Mr PHILIP CARPENTER.

AT BRISTOL,

By Mr C. BEILBY.

AT LIVERPOOL,

By Messrs EGERTON SMITH, & Co.

AND

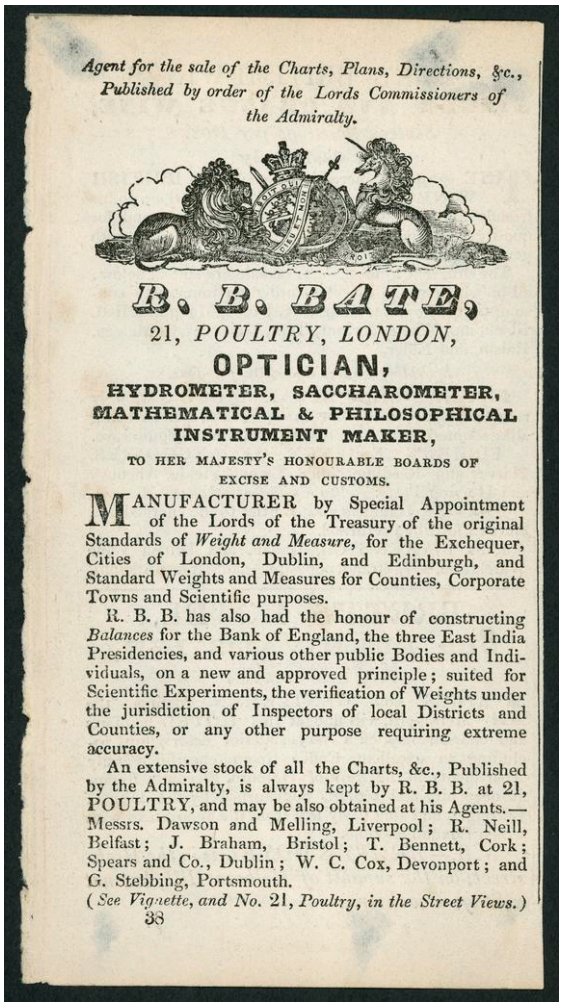
AT EDINBURGH,

By Mr JOHN RUTHVEN.

Figure 57.
Advertisement for Brewster's Patent Kaleidoscope, 1818.
Science Museum, Ref: 1951-687/18.
This shows that Carpenter's status as sole manufacturer of the instrument has been withdrawn and extended to seventeen other instrument makers.



Figure 58.
Polyangular Kaleidoscope, 1818-1847.
Science Museum, Ref: 1928-881.
Kaleidoscope on tripod by R.B. Bate.



Agent for the sale of the Charts, Plans, Directions, &c., Published by order of the Lords Commissioners of the Admiralty.

R. B. BATE,

21, *POULTRY, LONDON,*

OPTICIAN,

HYDROMETER, SACCHAROMETER, MATHEMATICAL & PHILOSOPHICAL INSTRUMENT MAKER,

TO HER MAJESTY'S HONOURABLE BOARDS OF EXCISE AND CUSTOMS.

MANUFACTURER by Special Appointment of the Lords of the Treasury of the original Standards of *Weight and Measure*, for the Exchequer, Cities of London, Dublin, and Edinburgh, and Standard Weights and Measures for Counties, Corporate Towns and Scientific purposes.

R. B. B. has also had the honour of constructing *Balances* for the Bank of England, the three East India Presidencies, and various other public Bodies and Individuals, on a new and approved principle; suited for Scientific Experiments, the verification of Weights under the jurisdiction of Inspectors of local Districts and Counties, or any other purpose requiring extreme accuracy.

An extensive stock of all the Charts, &c., Published by the Admiralty, is always kept by R. B. B. at 21, POULTRY, and may be also obtained at his Agents.—Messrs. Dawson and Melling, Liverpool; R. Neill, Belfast; J. Braham, Bristol; T. Bennett, Cork; Spears and Co., Dublin; W. C. Cox, Devonport; and G. Stebbing, Portsmouth.

(*See Vignette, and No.* 21, *Poultry, in the Street Views.*)

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Figure 59.
Trade card for R.B. Bate, 1832-1847.
Science Museum, Ref: 1951-687/3.
Details of Bate's instrument output.



Figure 60.
Kaleidoscope by Dollond, 1818-1880. Museum of the University of St. Andrews.

VI. A Continuum of Minor Variations

The different versions illustrate distinct articulations of the Kaleidoscopic principle. We should not consider Carpenter's 1817 model as the foundational instrument, but as one manifestation of a set of principles and ideas that can be differently interpreted and applied by different manufacturers. Adapting Nathan Rosenberg's concept (1982), the Kaleidoscope is a continuum of minor technical variations, applications, and possibilities. It is an abstract accumulation of approaches that is variously actualised in material instruments. Brewster attempts to set out the perimeters of this continuum in his *Treatise on the Kaleidoscope*, outlining different articulations of what a Kaleidoscope is, and what it can do (even to the extent of describing older uses of inclined reflections, such as Porta's multiplying speculum or Kircher's plane mirrors, 1819: 139-150).

But beyond the purposeful territory set out by Brewster, the Kaleidoscope was a constantly mutating framework of practices orbiting around an abstract notion of what this instrument could be and what it could do. It was a discursive and conceptual construct that existed in the air of this moment at the end of the 1810s. In Rosenberg's words, it formed a continuum of small improvements that had no original template. The Kaleidoscope presents an instructive case, because it was differently articulated by a large number of manufacturers over a very short period. Brewster's text and surviving Carpenter, Ruthven, Dollond, Harris, and Bate examples illustrate how similar principles can be differently approached, or how essentially the same instrument (such as the Carpenter and Ruthven models) were assembled using slightly different practices, based on a common conceptual model.

Over a longer period, with the entry into the market of pirate Kaleidoscopes, even further variations were introduced. The cheaply-made pirate Kaleidoscopes were the versions that the largest number of people used and that inspired most literature of the era. These came in every degree of style and quality. They were often discussed in relation to notions of authenticity (encouraged by Brewster, who worked hard to delegitimise those that broke his patent). They were, said John Timbs, 'rudely and inaccurately constructed' and 'sold at low prices by unscrupulous persons' (1860: 176). Timbs recalled a schoolyard scene:

> The writer well remembers in 1814-15, in a large school, the avidity with which pseudo-Kaleidoscopes were formed of paste-board cylinders, blackened planes of glass, and pieces of coloured glass, when the fantastic variety of results obtained by this rude means scarcely

> foreshadowed the symmetrical beauty of the forms subsequently obtained by more exact methods.[45] (1860: 176)

These illegitimate toys were harshly compared to the Brewster-approved brass tubes. They were the furthest, crude frontiers of a continuum that Brewster had lost control of.

VII. The Great Instrument Makers

Berg and Morrison-Low have both used Rosenberg's concept as a way of describing anonymous technical change in manufacturing (Berg 1994: 224) and instrument making (Morrison-Low 2007: 21). This provides a useful means of thinking about the technology of the lantern, which tends to form clusters of different types around a persisting template (Nürnberg bullseye, London Lantern, Phantasmagoria Lantern, biunial, mahogany type, dissolving pair, etc). Even where there is a possible first version of a type, as with Carpenter's Phantasmagoria Lantern, it makes little sense to talk of invention. Priority is difficult to prove because each type is so quickly absorbed into a more general manufacturing landscape, with numerous small alterations. The more pressing questions concern how manufacturing practice accumulates into a continuum of common approaches and how the technologies are embedded into culture.

Brewster's advertisement confirms seventeen instrument makers entering the nascent media market in 1818 (ScM 1951-687/18; fig. 57). Some of these, like the Dollonds and Joneses, were well-established instrument makers with excellent reputations; others, such as Schmalcalder and Berge, are now poorly known. It is not clear if they were, like Carpenter, making permanent transitions into the entertainment market, or if they were merely exploiting the popularity of the Kaleidoscope. Among these makers, surviving objects confirm that Bancks, Dollond, and W. & S. Jones all sold lantern slides. We know from an engraving that Thomas Blunt stocked a lantern at the beginning of the century, and, from a catalogue, that Egerton Smith sold lanterns twenty years later (1819: 10).

Peter and George Dollond, opticians to George IV (Clifton 1996: 87), were never known for media manufacture, but their inclusion in this list shows that Carpenter was certainly not the most prestigious instrument maker navigating a bridge between science and entertainment. I have found no documentary evidence of the Dollonds dealing in lanterns, but a set of astronomical slides with Dollond markings has survived

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[45] It is interesting to think that Carpenter would have had to deal with the paste-board makers to maintain a stock of cardboard tubes for his official Kaleidoscopes. One wonders if he ever asked his suppliers if they were serving other nefarious Kaleidoscope makers.

in the Museum of Applied Sciences (fig. 61). These slides suggest the ubiquity of lanterns in the instrument makers' output at this moment, even for more illustrious instrument makers.

William and Samuel Jones, another of the leading London firms, used their instruments and advertisements to situate scientific principles in a popular context. A series of catalogues from the turn of the century show popular curiosities nestled among telescopes, microscopes, theodolites, and instructive literature. In 1795 they were selling solar microscopes, camera obscuras, magic lanthorns (with 'sliders of best paintings'), burning mirrors, and perspective views (1795: 2-4). They also stocked electrical apparatuses and various bizarre objects, such as 'a magic picture for giving shocks', 'an artificial spider', and 'an electrical swan' (1795: 7). A number of demonstration instruments are listed, including an 'artificial eye in brass, to exemplify the nature of vision' (1795: 3; Adams 1789), planetaria and orreries (1795: 5-6; Bud and Warner 1998: 465-467; King and Milburn 1978), and a cometarium, 'exemplifying the motion of comets' in mechanical form (1795: 5; Bud and Warner 1998: 125-126; fig. 62).

Astronomical demonstration instruments were ostensibly sold for educational purposes, but they were also objects of conspicuous consumption. These instruments cast the motion of the universe in brass and gilt silver. Like the lantern, with its moving astronomical diagrams, they demonstrated the principles of astronomy as mechanical, scientific, and opulent wonder. These were among the many instruments in the Joneses' stock that flitted between instructive and marvellous associations. A paper-covered orrery in the Museum of the History of Science (fig. 63), shows that their instrument production implicated the printing trade (Morrison-Low 2007: 164-167). Their business was connected to a sprawling network of production infrastructures that were all tied up in the fashionable market for scientific curiosities.

The Jones catalogues show that the line between instruction and amusement was non-existent. They were not only supplying the 'serious teaching and research collections' emphasised in Morrison-Low's account of the firm (2007: 170), but were visibly targeting a market for popular amusements and everyday instruments. This catalogue illustrates a spectrum of instruments from useful drawing tools and slide rules, through to telescopes and microscopes, with both investigative and popular functions, and magic lanterns.

At the furthest extreme were the *'Instruments of Recreation and Amusement'*, explicitly framed as trifling curiosities. These objects included:

> The sensitive fishes, that have the property of swimming to a piece of bread placed a the end of a stick; and, when the other end is presented, of retreating and going back, sensible, as it were, of no substance for them to eat. (1795: 10; Morrison-Low 2007: 170-172)
>
> A Magic painter, exhibiting a copy of any one of eight different paintings, secretly chosen. (1795: 10; Terpak 2001: 173-175)

And returning from John Scott's catalogue of rational amusements:

> The Sagacious Swan, that, with a machine, makes three kinds of amusements—1st. the swan will point out the secrets of the cards; 2d. it will point answers to 16 humorous enigmas; and 3d. disclose any particular hour that was thought of, packed in a case. (1795: 10)

These were sold alongside other curiosities 'selected from the works of Guyot, Ozanam, Hooper, and other writers on Mathematical, &c. Recreations' (1795: 10). These were writers of popular texts on magic and optical illusions (Guyot 1769; Ozanam 1694; Hooper 1774), containing interesting games and explanations of optical curiosities (including camera obscuras and magic lanterns). Guyot, Ozanam, and others were adapted by the instrument makers for sale on the popular market. Just like Scott, and without apparently harming their reputation as important instrument makers, the Joneses exploited ongoing public tastes for popular curiosities.

One of their instruments of recreation was 'a magic-lanthorn apparatus' packaged with a very early chromatrope:

> A set of the artificial fire-works imitated, containing a series of brilliant and entertaining scenes of fire-works, cascades of fire, &c. producing altogether a pleasing effect, and not attended with any trouble, noise, or danger, when using; the whole contained in a neat mahogany box. (1797: 13; Robinson, Herbert and Crangle 2001: 67).

By 1799, they sold 'a new set of movable painted sliders, shewing the fundamental principles of astronomy, with the real and apparent motions and positions of the planets, stars, &c. &c. accompanied by a proper improved lantern' (1799: 3-4). By 1808, retaining the astronomical slides and 'improved lanterns', they offered a reframed version: 'Magic lanthorns, as Phantasmagoria, &c.' (1808: 4). This anticipated the marketing discourses of Blunt and Carpenter, capitalising on the popularity of the Phantasmagoria, without yet fully capturing the later makers' rational rhetoric. By 1817, perhaps in a drive towards greater credibility, the list of Scott-like curiosities are gone, but many of the 'optical recreations' remain hidden among the other instruments (the

electric swan and the planetaria are there, but the various ‘magic’ devices are absent).[46] This later catalogue also shows a clearer understanding of the potentials of the lantern; now listing: ‘Magic lanthorns, with various mechanical figures, for Phantasmagoria, &c.’ (1817: 4).

We see from W. & S. Jones, the Dollonds, Bate, and a broad network of contemporary makers, that Carpenter’s practices were embedded in a wider framework of manufacturing and retail practices that were already exploiting the wonder inherent in instrumentation and optical media. Optical instrument makers, mathematical instrument makers, publishers, printers, watchmakers, and toy makers, were all awake to the possibilities offered by a nascent market for mechanical curiosities and media machines.

Various approaches to media retail were tested over the winter of 1817. We have seen from the Kaleidoscope affair how the structure of the instrument was variable around a core principle. The key practices and principles of the new media trades are instructive for our understanding of the transforming lantern. The Phantasmagoria Lantern was not original in technology or exploitation. And it was not stable in its form or use.

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[46] Morrison-Low notes their disappearance: ‘The category in which these first appeared, “Instruments for Recreation and Amusement” had become “Instruments for Recreation” by 1805, and the entire class had been dropped from the catalogue by 1814’ (2007: 170).

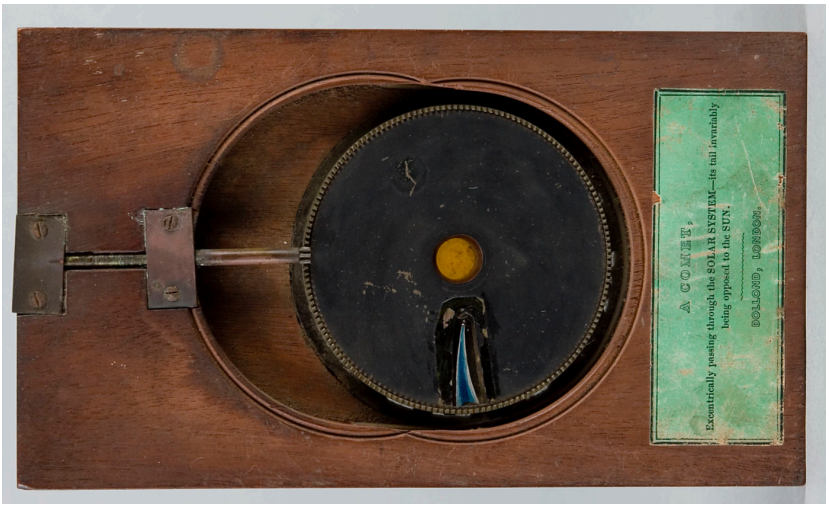

Figure 61.
Rackwork lantern slide by Dollond, 1800-1850.
Museum of Applied Sciences, Ref: H10273/3.

Sticker reads: A COMET, Excentrically passing through the SOLAR SYSTEM—its tail invariably being opposed to the SUN. DOLLOND, LONDON.



Figure 62.
Cometarium by W. & S. Jones, 1791-1859.
Science Museum, Ref: 1909-202.

Demonstrating the eccentric orbit of a comet around the sun.

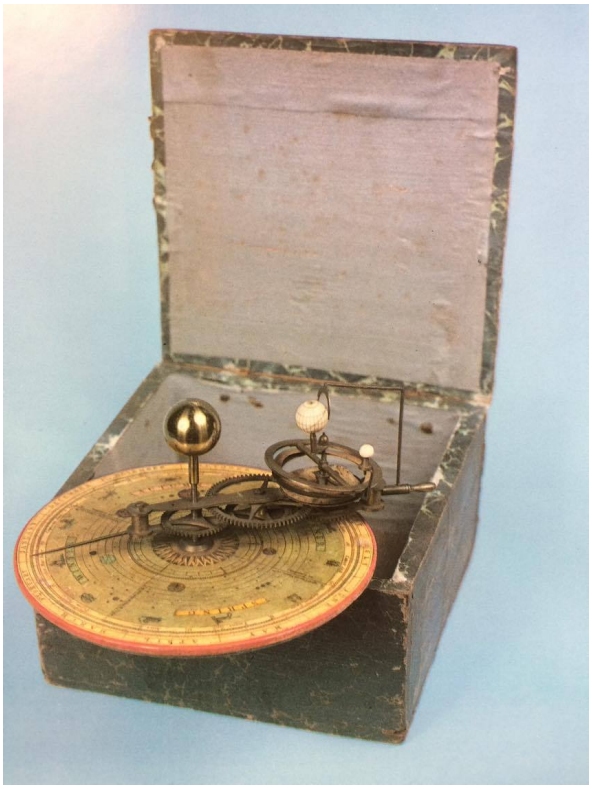

Figure 63.
Orrery by W. & S. Jones, 1791-1859.
Museum of the History of Science.

Demonstrating the orbits of the Earth and Moon. Made from brass, wood and printed paper.

Chapter 6.

Making the Magic Lantern

I. The Workshop Economy

In the early years of the nineteenth century, consumer retail remained as it had for some decades; slowly expanding due to greater affluence in the middle classes, but mostly unaffected by factory production (which remained isolated to select industries). Instrument manufacture, even for the popular domestic market, remained artisanal in organisation. There was no industrial-scale production of instruments. The first popular media devices took advantage of a longstanding network of manufacturing workshops to efficiently produce larger volumes of instruments. This is one reason for the trade's successful shift into popular optics, even before true mass-production factory methods were applied.

This was Birmingham's contribution to the history of media. The first Kaleidoscopes were born in the city because Carpenter could call on a vast and scattered network of independent workshops. The city was home to professional brassfounders, tinsmiths, glass makers, and japanners that had long been turning out great quantities of products.

Much media history is written as if practitioners were operating in a vacuum. Media historians tend to prefer exploring intellectual influences and in the process can ignore the material infrastructures inherent to a place and to the practices that emerge there. But Birmingham's role is crucial. Brewster could have commissioned the prestigious London makers, but they engaged in a different mode of business. London did not support a comparable system of independent workshops and could not handle a short-term, high-volume production contract as efficiently as Birmingham.

Carpenter did not make his own instruments. Like all instrument makers, he subcontracted specialist outworkers to produce composite parts. We do not know anything about the people who provided the materials or components. We do not know

the labourers who assembled them, or the goods carriers who distributed them. The entire production network that makes the existence of these instruments possible is obscure. Instrument historians know that outworkers produced metal and glass for the trade. When we attribute instruments to Dollond, or Carpenter, we entertain an operative fiction. We know so little of these mostly anonymous labourers that it is not useful to add qualifiers to the great instrument makers. They are figureheads that indicate a deeper infrastructure of practitioners. We use their names as shorthand for more complex descriptions of trade networks and economic relations. Our methods privilege named individuals with surviving historical footprints.

I want to develop methods that can trace production infrastructures and find a place for small labourers. We overrepresent the middle classes by prioritising moments of invention over everyday practice. Existing literature tends to make the working classes either the beneficiaries of technological progress, or its unwitting victims. But the working classes drove the history of technology. I want to bring new historical actors into media history.

To understand the lantern trade's emergence, we need to build a structural history of material practice, addressing the networks that supplied brass, tin, glass, paper, and chemicals to the trade, and that triggered the transformations in popular media. In this chapter, I will show how Birmingham's workshop economy was implicated in the production of the Kaleidoscope and Phantasmagoria Lantern. I will trace the networks that produced components for Carpenter's instruments and address the methodological implications of writing an anonymous media history.

Increasing output potentials in the metal trades allowed greater production of instruments, expanded markets, and new technologies of vision. Where scholars have discussed the importance of new optical technologies to the expansion of modernity and capitalism, they tend to credit the ingenuity of monied innovators. I will show how this history was driven by deeper economies of production. The new media trades came from a different quarter than we had thought; not the respectable, top-coated master artisan, but the ragged and diversified metalworkers.

II. The Ironmonger Opticians

> The Eye has always played a distinguished part in the production of satisfaction and suffering, pleasure and pain. In former times, however, the Eye was frequently the tyrant,—it is now almost universally the victim;—the minion has trembled at its flashes— the lover has been enraptured by its glances—now that persecuted organ is less frequently

> the occasion of terror or ecstacy, than an object of commiseration. How this melancholy change has come to pass, we must ask the man of Birmingham, who writes 'Ironmonger' over his shop-door and 'Optician' over his window. (Doublet 1850: III)

In a brazen preface to his 1850 *Manual of Optical Instruments*, Thomas Doublet, instrument maker of Finsbury Square in London, describes a transformation in which the optical trade attains new-found skill and respectability. He says that the very highest art of the optical instrument makers, attained around 1830 and luckily concurrent with Doublet's own practice, was preceded by a darker age of shady, ham-fisted, reckless commercial irresponsibility. Prior to Doublet's own era, the eye, once respected by the ancients and renaissance geniuses, was blighted by instruments of infinitely poor workmanship. This 'melancholy change', he reports, was executed by the opticians of Birmingham.

This remarkable takedown of a rival city surreptitiously reveals the importance of Birmingham to Doublet's present and preceding eras of instrument making. But what is more startling is his recognition of an obscure history of lower metal-working opticians in Birmingham, normally repressed beneath the discursive dominance of the master opticians. He continues:

> The 'Optician-Ironmonger' or 'Brummagem-Optician' (whichever designation he may choose to adopt) is a pure experimentalist, his praiseworthy aim being by every device, which chicanery and impudence can suggest, to ascertain by what means public credulity can be most easily assailed, and his own financial associations most agreeably excited. A horse-doctor undertaking to perform the operation of tying the aorta would not be a more dangerous charlatan than the scissors-grinding optician, who professes his ability to distinguish between an achromatic telescope and an aromatic gridiron. (Doublet 1850: iii)

Who were these 'pseudo-opticians' (Doublet 1850: 12) and 'ludicrous anomalies' (Doublet 1850: iii)? They were the early practitioners of the instrument trade in Birmingham, trained in metalworking and glassmaking. They were opticians born of a unique set of local circumstances and embedded in longstanding trade networks quite separate from the famous London firms. The ferocity of Doublet's attack suggests their preeminence in a lower strata of the market. He needed to discredit their practice, as Carpenter had once discredited the bullseye lanterns of Nürnberg.

The Ironmonger Opticians made low-quality instruments for itinerant vendors, as Doublet confirms (1850: iv; fig. 64). Optical instruments were not only sold by high-class sedentary retailers. There was a class of roaming opticians who sold lenses to lower professionals—who might need an eyeglass or magnifier—or to rural communities and the urban poor. Glasses were needed by everyone and so itinerant salespeople carried a range of ready-made articles that could be purchased for cheaper than from established opticians. They might also sell slide rules and mathematical instruments to carpenters and engineers.

The lower opticians, Doublet conjectures, made the most inferior lenses since the spectacle had been invented (1850: iii). They were not troubled by apprenticeships (for Birmingham had no guilds), but were free to set up shop and turn out endless numbers of 'real Brazilian electrically-illuminated pebbles' (1850: iv). Doublet scornfully calls their wares 'so-called spectacles' (1850: iv).

But his protests are rather forced. The itinerant vendors were not universal rogues and Doublet is clearly trying to protect his own trade at the bottom end of the spectacle market. He urges customers to be 'extremely cautious in their selection, not so much of the spectacles as of the man that makes them' (1850: 12). He advises: 'if possible, before purchasing of a country dealer, endeavour to ascertain the London optician by whom he is supplied' (1850: 12). It would be much the better, of course, if the London optician was Doublet himself.

For our purposes, Doublet's rampage reveals a lesser evidenced mode of instrument making and suggests a relationship between the early Birmingham lens grinders and wider manufacturing trades. Most accounts of the instrument trade normalise the famous London houses, neglecting the distinct local circumstances and traditions of other regional contexts. Morrison-Low is one of the few instrument historians to take the provincial trades seriously. She explains that Birmingham's professional fluidity and extensive practical networks enabled (or forced) instrument makers to engage in multiple trades simultaneously.

> In a city renowned for the variety of its brass metal manufactures, it is not surprising to find directory listings for instrument makers coupled with such descriptions as 'manufacturer of plated and brass telescopes, fancy hearth brushes, toasting forks, plated and brass tubes for umbrellas &c, plated and brass tubes of every description, umbrella and parasol frames complete &c' or 'compass and pincer maker', or 'military feather and barometer maker', or 'gilt toy, mathematical instrument

> maker and bell founder', or the more macabre 'coffin furniture and measuring tape manufacturers'. (2007: 111)

Such combinations are not so bizarre when we account for the practical footprint of Birmingham's trades. These mostly all require similar skills, materials, and infrastructures. Elsewhere, we find Richard Bakewell, maker of mathematical instruments, brass compasses, and brass dog collars (2007: 108). Thomas Carpenter was a compass, steel toy maker, and wire manufacturer (Clifton 1995: 49; E.G.R. Taylor 1966: 444; R.L. Carpenter 1878: 7). A brassfounder or metalworker would manufacture practically anything that the local market could support. Instrument making was driven by the general commercial landscape and each manufacturers' ability to navigate it. These Ironmonger Opticians, as Doublet had contemptuously suggested, worked 'not for sight, but for sale—for the market, not for the man (Doublet 1850: iv).



Figure 64.
Miniature single-draw telescope and cardboard tube, by an unknown maker, nineteenth century.
Phillip Roberts collection.

Cheap, poorly-made instruments such as this were produced for the itinerant and lower-class markets. They tend to be unmarked and so are generally untraceable.



Figure 65.
Trade card illustrating The Artizans' Library, Birmingham, 1797.
Birmingham Library.

III. The Dissenters

Carpenter's practice was framed by his social and intellectual context. He was a Unitarian and so benefitted from a local support network of educated and business-minded peers. His early life reveals how he enjoyed social privileges that allowed him to attain a standing in the trade and write himself in to the historical record. It is possible that he was trained by one of the mythical Ironmonger Opticians, but Philip himself became a high-class retailer. I will first outline the cultural context of his practice in Birmingham and then explore the material footprint of his instrument production among the workshops of the city.

The Carpenters were not from Birmingham, but nearby Bromsgrove. Philip's father, George Carpenter, a carpet manufacturer, suffered 'embarrassed circumstances […] owing to depression in trade' (L. Carpenter 1842: 51) which led to their relocation to the regional business capital. With little money, but high social capital among the dissenting community, the Carpenters first came to Birmingham.

In the late eighteenth and early nineteenth centuries this city was a centre of nonconformism. It did not have a municipal charter until 1834, meaning that Birmingham was not subject to the Clarendon Code, which restricted the settlement and freedom of religious dissenters (Hopkins 1989: 4; Andrews 2003: 1-10). The local dissenting community, committed to social improvement and scientific education (Thompson 1968: 28-32), could have supported the career of a young instrument maker.

In 1791, rioters burned down the house of the famous Unitarian Joseph Priestley and targeted other dissenters (Upton 1993: 50-57; Watts 1978: 482-490). The local Anglican population unleashed long-held resentments towards the wealthy dissenters (Thompson 1968: 85-87). Still subject to legal persecution elsewhere in the country, the dissenters here practised openly. When Priestley organised a dinner in support of the French Revolution he brought an angry church-and-king mob upon the city's religious minorities, accused of harbouring sympathies for foreign powers. The Carpenters were among those targeted by the rioters (R.L. Carpenter 1878: 44). Learning this fact before hand, they had enough time to find safe refuge and to move their valuable possessions and furniture to Kidderminster. Thomas Carpenter had several run-ins with rioters armed with bludgeons and the family recorded some £60 of damage and losses (R.L. Carpenter 1878: 44-45). Priestley's home was burned to its foundations.

Yet Birmingham remained a relative beacon of tolerance. The largely middle-class dissenting community invested in business, exploiting local workshops and metalworkers across Birmingham and the Black Country. Both Philip and Thomas entered the upper strata of the workshop economy. Thomas was a steel toy and compass maker on Lombard Street and New Canal Street (Clifton 1995: 49; R.L. Carpenter 1878: 7). He was involved in the Brotherly Society of Birmingham and founded the Artizans' Library (L. Carpenter 1842: 18; R.L. Carpenter 1878: 2; Matthews 1827: xxii-xxiii; fig. 65). The library was conceived as a way of contributing to 'the sources of improvement possessed by the labouring classes' (L. Carpenter 1842: 18). Thomas's involvement in local scholarly and charitable institutions suggests the family's integration into Birmingham society. Unitarianism would have been an important influence on the young Carpenters' careers as scientists, artisans, and reformers. It provides formative context for the early stages of Philip's career.

Philip Carpenter started work around 1796 (P. Carpenter 1827: 26). We have seen how he was trained by his uncle, William Carpenter—a certain Brummagem-Optician and possible ironmonger. We find them both in a small workshop on Inge Street in 1808 (Clifton 1995: 49).[47] William died that same year, with no children (R.L. Carpenter 1878: 53). This is also Philip's first appearance in the historical record. It indicates that he succeeded to the Inge Street business in 1808, aged 31. Philip's father was not an instrument maker, yet it is not surprising that his son should enter a scientific discipline. There was an optician in the family.

The local nonconformists possessed a keen entrepreneurial spirit. They were drawn to Birmingham by its relative freedom of worship, but also by commercial opportunity in its expanding industries. Carpenter's Unitarianism helps to explain why instrument manufacture was an attractive profession. The existence of a supportive Unitarian community and the active mechanical and artisans' societies provide clues to his early career, how he trained, inherited an optician's workshop, and achieved a position of prominence in the trade.

Following the riots, life in Birmingham became more difficult for nonconformists. The Anglican population subjected the dissenters to intimidation and economic boycott, driven by a mixture of patriotism, economic hardship, and class antagonism (Jones 2009: 188-200; Watts 1978: 482-490). This would have been a difficult time to start a

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[47] Birmingham did not tend to follow formal indentured apprenticeships, as was common in London, because it lacked an embedded guild system. Timmins explains: 'No trade unions, no trade guilds, no companies existed, and every man was free to to come and go, to found or to follow or to leave a trade just as he chose. The system of apprenticeship was only partially known, and Birmingham became emphatically the town of "free trade," where practically no restrictions, commercial or municipal, were known' (1967b [1866]: 211).

business, but I have found no evidence to suggest how Carpenter negotiated this climate. Perhaps the poorer Anglican community were less important to his early business than the monied dissenters. Public hostility dissipated over the first decade of the nineteenth century, before the Unitarians were fully emancipated in 1813 (Watts 1978: 487-490). Dissenters could now legally settle anywhere, preach, publish, and publicise their beliefs. Carpenter was already an established optician by this time.

IV. Carpenter's Growing Business and its Local Context

Clues to the success of Carpenter's early business are found in the records of solicitors Smythe, Etches and Co, which dealt with his purchase of a leasehold on Bath Row in May 1813. He acquired 1041 square feet of land, to be held for 107 years at an annual cost of £13 3d (LB MS 3375/407007).[48] Bath Row became the site of a new manufactory, replacing the little workshop on Inge Street. It suggests that Carpenter was becoming a successful instrument maker, supplying microscopes, telescopes, and spectacles to the trade.

A second document shows that he mortgaged the property for £500 in 1816 (LB MS 3375/407009). By then it consisted of a dwelling house, manufactory building, and outbuildings. By 1817 Carpenter had established a large trade in lenses for other instrument makers. Stuart Talbot claims that Carpenter had already become the leading supplier of achromatic lenses by 1812 (2006: 17). Timmins, following information given by Carpenter's one-time foreman Robert Field, says that he was supplying Peter Dollond with large numbers of telescopes (1967c [1866]: 534). It seems as though Carpenter was attaining some financial success, given the figures shown in the solicitors' records. His reputation in the later 1810s was sufficient to secure the prestigious Kaleidoscope contract.

Carpenter opened a little single-story shop on New Street around 1819 (*Birmingham Weekly Post* 1895), retaining the Bath Row property. Juror's lists show that he was living in the house on Bath Row while running this new shop (WCR QS/76/3), splitting manufacture and retail operation across these two sites. The New Street property acted as a retail showroom for the instruments made on Bath Row. Both sites possessed intrinsic value for Carpenter's divided practice. New Street was a highly active retail area with significant passing trade between the Bull Ring and Jewellery Quarter. Bath Row sat on the Birmingham and Worcester Canal, which connected the

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[48] The size of the property is useful (and quite unusual) information to have. John Millburn notes that 'almost nothing is known for certain about the size of individual instrument makers' workshops' (1986: 84; Morrison-Low, 2007: 291).

city to the Severn and Bristol. In the other direction, via the Gas Street Basin, the Staffordshire and Worcestershire Canal, and the Trent and Mersey Canal, was Liverpool. By 1822, Carpenter was supplying to instrument retailers in both cities—Edward Bird & Son in Bristol (Bird 1818) and John Bywater in Liverpool (Bywater 1822: 327).

The 1818 trade directories give an indication of the local commercial context. There were few retailers on Bath Row, but several different manufacturers: Edward Armfield the button maker, William Barrs the malter, John Bramich the plater, and Samuel Hodgkinson the engineer (*Commercial Directory* 1818; *Wrightson's Directory* 1818). New Street is far better documented, with an array of businesses operating around Carpenter's shop. The street had not yet become a single-use retail site, so there were manufacturers alongside merchants and other businesses. Of particular note are the ten listed attorneys, ten merchants, and numerous manufacturers and sellers of clothes, fabric, and fashionable items. There were also seven metalworkers and nine manufacturers of small goods. Three of these were cutlers, three were jewellers, one was a pin maker, one a needle maker, one a nail manufacturer, and one a button manufacturer. The majority of New Street businesses made or sold fashionable commodities. Two of the jewellers were also silversmiths, while John Jakes the button maker dealt in gilt, plated, dipped, and silver buttons. There were two toy dealers, three goods carriers, and various merchants and grocers.

Carpenter's shop was surrounded by wealthy and prestigious businesspeople. W.R. Eginton, a painter on glass, and Mary Heape, a miniature painter, also worked on New Street, showing that there were at least two local precedents in image making. That Carpenter's business model, centred on consumer retail, should prosper on New Street is no surprise. The commercial character of the street helps to explain how he developed his business.

That Carpenter began his career as an instrument maker can be attributed to his family and wider nonconformist support network. That he later specialised in kaleidoscopes, lanterns, and spectacles is more likely a result of the wider commercial context. His focus on consumer commodities over experimental scientific equipment was appropriate to the trade around New Street, and in the context of Birmingham manufacture more broadly, where successful toy and fabric trades were driven by demand for fashionable buckles, buttons, and lace.

The wider literature gives Carpenter's early career the appearance of sudden emergence and inventive genius. But if we look around him to consider the cultural and religious milieu of his early life, it becomes clearer why his career took on the shape

that it did. Carpenter became an instrument maker because his uncle was already part of the trade. He was supported by the wider Unitarian community, as was common, and his nonconformism may provide an explanation for his emphasis on practical education. The Unitarians were committed to scientific rationalism and, moreover, Carpenter's early success proved that there was a large public market for educational content. His shift into popular instruments was similarly suggested by his local commercial context. What we glimpse here is Carpenter identifying and exploiting the parameters of his paradigm. There was money to be made in the popular market and Carpenter's training and connections left him well-placed to take advantage.

But this short history also implicates other practitioners. We have seen that other instrument makers and retailers were developing similar products and practices. Blunt and Ackermann, in different contexts, were making similar gambles on the changing London market. All of these people were utilising extensive networks of manufacturing expertise. These businesses are intersections of trade connections that sprawl outwards into a hinterland of forgotten workshops. Carpenter remains important only as an indicator of the work of others.

I will now explore the manufacturing networks responsible for producing the new media technologies and show that changes in the industrial base—newly energised, organised, growing—made all of these products and practices possible. The magic lantern had existed for 150 years, but the industrial manufacturing and retail paradigms were not ready to fulfil its promise until the early nineteenth century. I will begin by revealing the networks and discourses that powered Carpenter's original commercial triumph: the 1817 Kaleidoscope. The practices and networks we have discussed were crystallised in the success of the Kaleidoscope. This instrument was the experimental model for future exploitation of consumer media and optical toys.

V. The Kaleidoscope and its Makers

It is not completely clear how Carpenter attained the Kaleidoscope contract. Brewster is known to have had connections with significant instrument makers in Edinburgh and London (E.G.R. Taylor 1966: 357), but little evident association with Birmingham. A dubious note by Brewster claims that Carpenter sought him out for the manufacturing rights. He says that Carpenter had attempted, and failed, to produce a Kaleidoscope of his own, based on the principles of an earlier mirror arrangement of 1717 by Richard Bradley (Hecht 1993: 53).

> Having exercised his ingenuity for some time, he abandoned the attempt as impracticable, and set off for Scotland for the purpose of offering his services in manufacturing the patent instrument.[49] (1818: 152)

At any rate, it is likely that he was accepted as manufacturer because of his integration into the Birmingham workshop economy. Little is known of his pre-1817 manufacturing practice, despite uncertain claims that he was leading supplier to the London trade (Talbot 2006: 17; Timmins 1967c [1866]: 534; Morrison-Low 2007: 225; Davidson 2011: 13). Carpenter worked from a relatively small workshop, large enough for lens grinding and assembly, but certainly not for brassfounding or metalwork. There is no way of knowing the extent of his early output, but it is reasonable to expect that he was competent and already reasonably successful, given that he was capable of attaining Brewster's contract and that he then produced enough Kaleidoscopes provoke a mania.

Examination shows that the kaleidoscopes were assembled from multiple serially-produced parts. Given the volume produced (around 200,000, 1819: 7), this would have required outsourcing to local subcontracting networks. Birmingham was then one of the biggest manufacturing cities in the world. It had not mechanised, as had key industries in the north-west of England, because it had already developed a highly-efficient network of small workshops that individually manufactured small items (buckles, buttons, jewellery), individual parts (gun parts, screws) and metals (wire, tin, iron, brass; Hopkins 1989: 60-61; Timmins 1967 [1866]). This manufacturing economy functioned through the putting-out system, where many different workshops would participate in the production of parts, to be bought and assembled elsewhere (Berg 1991, 1993). Individual workshops each focused on few specific tasks and outputs. Berg describes this as 'a workshop economy built on specialisation and the division of labour, on dispersed units concentrated in specific locations and on close networking among these units' (1993: 20-21). Subcontracting was common, as it was elsewhere, but without the drive towards increased capital and single-site manufacture typical of other industries. The instrument trade was small in comparison with other trades. There were few appreciable benefits to be had by mechanised production, or by making truly industrial quantities of goods, because it had already attainted sufficient effectiveness through hand-technologies and workshop organisation. There had previously been little

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[49] It is unclear why Carpenter was not able to produce a version of his own, considering the relative simplicity of the instrument, or how he came to hear of it in the first place. Brewster mentions 'a time when the manufacturer of the patent Kaleidoscope was in the hands of another person' (1818: 152), but there is no indication of who this mysterious figure could be. All other evidence points to Carpenter as its earliest manufacturer.

need to produce instruments in bulk, but the Kaleidoscope was a different kind of enterprise.

Due to its broad non-specialist appeal, the Kaleidoscope could claim a larger market than was typical of other instruments. The city's manufacturing networks were expanding at the beginning of the century and so Carpenter could produce a greater volume of instruments than was previously possible. The instrument makers did not themselves require an industrial base, but through efficient subcontracting they could make use of industrial expansion in the metalwork and toy trades.

As an optician, Carpenter would surely have been a skilled lens grinder, but it is doubtful that he could have produced the sheet tin, brass tubes, and wooden boxes required for his instruments. Indeed, there would have been no need for him to do so, as the local workshop economy could have provided ample tinsmiths, brassfounders, and box makers to supply his manufactory. Birmingham was a global centre for all of these trades. His own workshop would have likely contributed only lenses, assembly, and finishing (painting, polishing, packing, etc.). Given the diversity of minor specialisms in the city, it is not even certain that his workshop did all of these things. Lens grinding, painting, and japanning were all practised professionally by small tradespeople.

This explains the design of the early Kaleidoscopes. Disassembling the Carpenter Kaleidoscope (fig. 53) shows that its body is constructed from two brass tubes of slightly different diameter (so one could slide into the other), plus several moulded and cut fixings to hold the tubes together. These required professional founders. The *Commercial Directory* lists 82 brassfounders and nineteen brassworkers, in addition to two large brassworks (Birmingham Brassworks and William Cooper, 1818: 29). One brassworker in particular, John Benton of Livery Street, is listed as specialising in telescope tubes and 'plated and brass tubes of every description' (*Commercial Directory* 1818: 62; *Wrightson's Directory* 1818: 12). Little is known of Benton's business. He would likely have employed several labouring metalworkers, each performing individual tasks and outputting finished brass tubes. As a specialist supplier to the instrument trade, it is possible that he made some of Carpenter's lens tubes (probably many brassfounders did). Carpenter would certainly have made use of a wider network of professional expertise.

The tubes used for scientific instruments were made by drawing sheet brass through a mould under considerable pressure (Morrison-Low 2006: 178-183; Barclay 1993). This process was performed by several workers, each specialising in one phase of production (Aitken 1967 [1866]: 321-322). Strips were cut from sheets of brass and

rolled into a cylinder, with a seam down its entire length. It was given to the wirer ('usually a girl', says W.C. Aitken), who binds the seam at intervals with iron wire; then to the charger, who adds solder along the length of the seam; then to the solderer, who heats the tube in a soldering stove to melt and bind the tube together. It is then washed and drawn under pressure, to tighten the tube, strengthen it, and remove imperfections. A heavy, hand-operated metal guillotine cuts the tube to the required length.

The ends of the Kaleidoscope were made on the same presses used to make buttons, a key output of the Birmingham toy trade. This was done by stamping a supple disk of brass with a die matrix. That these practices were embedded in the surrounding workshop economy is confirmed by Brewster's own complaints that 'the tinmen and glaziers began to manufacture the detached parts of it [the Kaleidoscope], in order to evade the patent' (1818: 410). *The National Register* said it was 'peculiarly liable to imitation' (1818: 148). Professional artisans were capable of pirating the instrument because it was designed with their existing skills in mind. These skills were, in Rosenberg's words, 'technologically convergent' across several trades (1976: 14-16). Instrument making, metal production, and the toy trades mutually supported different sets of manufacturing skills that could draw on each other to increase productivity.

The Kaleidoscope was then fitted with inclined mirrors (fixed to wood and glued inside) and a lens, or object cell. This would probably have been done in Carpenter's workshop as there were no cognate skills available in surrounding workshops. A local japanner could have applied an enamel finish to the outer tube and Carpenter (or hired workers) would then have polished and boxed the finished instrument (in a cardboard tube bought from elsewhere).

All of Carpenter's instruments would have been integrated into the surrounding workshop economy in this way. This was true of most instrument makers. Even among the most gifted, there was simply no need to duplicate skills provided by other trades. The core skills of the optician or mathematical instrument maker would also have required access to key materials, thus integrating their workshop into a broader network of industrial practitioners. Glass, brass, tin, and manufacturing expertise all had to come from somewhere. Parikka suggests the potential of studying the mining and preparation of materials in contemporary media as a valuable field for potential research (2015), but neglects to follow his own thread into the mines and forges of media history. There remains a neglected area of study surrounding the material and labour economies of historical media systems (Roberts 2016c).

The Kaleidoscope was the first instrument to fully exploit the expanding industrial base to produce a large quantity of products. Through efficient design

choices, Carpenter utilised the greater production capabilities of the Birmingham workshops to put out a far larger volume of instruments than was typical. The instrument appealed to growing popular interest in spectacle, as we have seen, and so Carpenter could build a larger potential market than previous instruments. That the manufacturing contract had to be extended to seventeen other makers only a year later shows that neither Brewster nor Carpenter fully anticipated just how successful the Kaleidoscope craze could become. Moreover, the networks and workshops required to produce the instrument show that their innovations were driven by the forgotten labour of others.

VI. John Ruthven and the Sheffield Workshops

Ruthven's Universal Kaleidoscope provides a useful analogue case. This instrument demonstrates similarity in design and production, but is rooted in a different manufacturing context in Sheffield. Like Birmingham, Sheffield was a new manufacturing city, rapidly expanding in the early century with an economy based on metalwork and cutlery production. Sheffield's manufacturing base was also structured around small workshops and division of labour production. Brewster opened the Kaleidoscope to other instrument makers in London, Edinburgh, and Bristol, but these makers also required advanced metalworking economies to meet production demands. In Ruthven's case, in the absence of the required infrastructure in Edinburgh, these were found far southward in Sheffield.

John Ruthven was an Edinburgh instrument maker authorised by Brewster to sell Kaleidoscopes to the Scottish market. An example in the National Museum of Scotland (fig. 66) shows that his Universal Kaleidoscope was almost identical in design to Carpenter's; produced in the same modular fashion, but finished in red. Ruthven did not make these instruments himself, as revealed by a fragment on the Kaleidoscope in *The Home Life of David Brewster*. In a series of letters, reprinted here, between David Brewster and his wife Juliet (née McPherson), who was managing distribution of the instrument, we learn that the Ruthven Kaleidoscopes were produced in Sheffield by a manufacturing business called 'the house of Cam and Cutt'.[50] Brewster writes:

> We arrived here [Sheffield] this forenoon from Leeds, and have been obliged to remain all day, in consequence of there being neither coach

[50] This dialogue is described dismissively in the text as correspondence between Brewster and 'his wife'. However, Juliet had information on distribution that David was not aware of and, as the letters reveal, Ruthven depended on her for access to retail Kaleidoscopes. This shows that she was a major participant in the business.

> nor mail for Birmingham after our arrival. We have, however, spent our day very agreeably in visiting the principal manufactories, with which we were much delighted and entertained. We were introduced to most of them by Mr. Cutt, the partner in the house of Cam and Cutt, who have under taken to manufacture the kaleidoscopes for Mr. Ruthven. They have agreed to make and sell the instruments under my patent on the same terms as Mr. Carpenter, provided I get his permission to allow them to be employed. This I must do, as he cannot possibly supply the demand. (Gordon 1869: 96)

Cam and Cutt were an amalgamated partnership of James Cam, an edged-tool maker of Norfolk Street, and John Priston Cutt (more often Cutts), an optician working next door (Stevenson 2016b). Both are present in trade directories throughout the 1810s and 1820s, but only appear as Cam and Cutt in 1818 (*Commercial Directory* 1818: 421). This, as Morrison-Low suggests, may be because they amalgamated 'solely to deal with this single lucrative contract' (2016: 51).

This presents a curious example of a prestigious Edinburgh instrument maker outsourcing production to Sheffield. Cam and Cutt are not named in any of the Kaleidoscope advertisements, so their manufacturing footprint would have been invisible to consumers in 1818, who were purportedly buying a stamped instrument by Ruthven. This is evident from a 'Description of the Patent Kaleidoscope' in *Blackwood's Magazine,* which credits Ruthven with manufacturing the instrument, despite his outsourcing arrangement with Cam and Cutt:

> The Kaleidoscope, in its popular form, has been manufactured with much taste by Philip Carpenter, optician in Birmingham, and by Mr John Ruthven of Edinburgh, to whom the public is already indebted for the ingenious printing and copying presses with which he has enriched the arts. (1818: 122)

We know that outsourcing was common in the instrument trade (Morrison-Low 2013, 2016: 46-47; McConnell 1994: 38), with provincial makers like J.P. Cutts supplying wholesale parts and instruments to the London trade, to be marked and sold by more famous businesses. Carpenter also started as a wholesale manufacturer, only opening his shop on New Street as the Kaleidoscope wave struck. Two identical microscopes in the Whipple Museum show that he had once made instruments for W. & S. Jones (O. Brown 1986: 128-129).

The logic of provincial wholesale was based on the advanced output potential of the new industrial cities. The old seats of trade in London and Edinburgh could not

produce the same volume of metal products. Cam and Cutt formed an effective partnership because their individual trades provided access to the metal and glass production networks. But Cutts was not yet a retail optician, nor famous enough to invest the Kaleidoscope with appropriate levels of prestige. This required a Dollond, Jones, or Bate stamp.

The instrument makers of Sheffield were extremely diversified, manufacturing a large range of metal goods. A double-sided trade card in the Science Museum (fig. 67) advertises Cutts as 'manufacturer of Spectacles, Telescopes, Opera Glasses &c.' and, on the reverse: 'CUTTS AND CAM / Manufacturer of Table Knives &c. AND Factors in General' (ScM 1951-685/21) This shows that the partnership continued James Cam's principle cutlery and edged tool trade, and also dealt in quantities of other items. This diversity of trade was enabled by Sheffield's little masters system, which operated through many independent workshops, connected through trade and contracts, in a long chain of production. Morrison-Low explains:

> This system, borrowed from the cutlery trades, allowed self-employed men to rent space within their factory under contract to carry out specific work. Each 'little mester' would employ and pay his own workmen, providing them with both tools and equipment; materials were either brought from the factory proprietor or elsewhere, and the finished items sold back to the factory proprietor: this allowed enormous flexibility in terms of economic hardship, although few great fortunes were made. (2007: 83)

Birmingham's workshop economy was very similar, with the metal, toy, jewellery, and gun trades organised around independent, specialised manufacturers contributing parts and processes to a finished product that passed through many hands (Hopkins 1989). Carpenter was chosen as sole manufacturer of the Kaleidoscope because he was already embedded in this economy. A year later, with Carpenter and his extended production networks unable to satisfy demand, an analogue manufacturing economy was required to supply the northern and Scottish markets. Cam and Cutt offered access to metalworking networks with comparable output potentials, while the established name of Ruthven, Bancks, or Schmalcalder provided greater consumer credibility.

The extent of Ruthven's reliance on external production networks is revealed in Juliet Brewster's reply to her husband:

> I was very much disappointed that I did not get your promised long letter to-day, and so was poor Mr. Ruthven, who flattered himself that you

> might naturally have made some mention of Carpenter's extraordinary conduct in not supplying him with any instruments, nor even sending him a line to account or apologize for the same. You never saw a person in such real distress as Ruthven is—the public are becoming impatient and clamorous now at the delay, and he has orders to an amount that is prodigious. One person offers him the money for 150 to send abroad in ten days. The ship sails then, and he will not take the instruments after that period. Mr. Ruthven has come to the resolution of setting off to-morrow for Sheffield and Birmingham. People insist on leaving their money in advance in order to secure their chance, and from six in the morning till six at night his room is beset with people. They cannot understand how completely mismanaged it has been, and that the capital of Scotland, and your place of residence, should not contain a single kaleidoscope for sale for the last eight days! I am sorry to vex you, but if you saw Mr. Ruthven's face you would not wonder at my urgency! (Gordon 1869: 97-98)

Not so for Carpenter, working in a different manufacturing context to Ruthven. The difficulty in securing retail Kaleidoscopes for the Scottish markets shows how deeply the instrument was embedded in the new industrial manufacturing networks, and suggests why Carpenter replicated this approach with the magic lantern.

Cutts opened a retail shop in London sometime in the 1830s, attaining enough credibility to retail in his own branded instruments. His businesses dealt in microscopes and other optical goods. Most interestingly for our purposes, he also retailed consumer instruments and early media. A trade card for the later J.P. Cutts, Sutton, & Son illustrates several media instruments, including a Phantasmagoria Lantern and photographic cameras (SA s09753; fig. 68). A number of surviving instruments bear the trade mark of the later Cutts businesses: an anchor accompanied by the words 'TRY ME' (fig. 70). This is not the marketing strategy of a sober retailer of scientific instruments. It is an attempt to capture the fleeting attention of the curious shopper. Cutts' instruments were produced to capture the wonderment inherent in the transformed mechanical vision of the modern consumer.

I have an identical lantern in my collection (fig. 69) to that in the Cutts trade card, sensibly made from folded, welded, riveted, and japanned tin, with a small brass lens tube to house the objective. I cannot confirm that this lantern was produced by Cutts, or in Sheffield, but it can usefully stand for other anonymous provincial media instruments—all designed and produced in line with existing workshop skills and

processes. This lantern may be from a Sheffield workshop, or from Birmingham, or elsewhere. It is indicative of the more common type of lantern produced in the first half of the nineteenth century; not a glorious, polished brass instrument bearing a prestigious maker's nameplate, but an anonymous product of anonymous labour. It is the kind of lantern that drove the expansion of the trade and propelled the medium's popularity. All of this originated in the minor workshop networks around Cutts and Carpenter.



Figure 66.
Brewster's Patent Kaleidoscope, 1818-1830. National Museums Scotland.
Simple Kaleidoscope with object cells, by James Cam and John Priston Cutts, marked by John Ruthven. This model has a red finish, but is almost identical to Carpenter's. One end is stamped with an identical design (visible in image), the other is the same, but with new text reading: 'Ruthven, Edinburgh'. These were clearly pressed using dies from the same source as Carpenter's Kaleidoscope

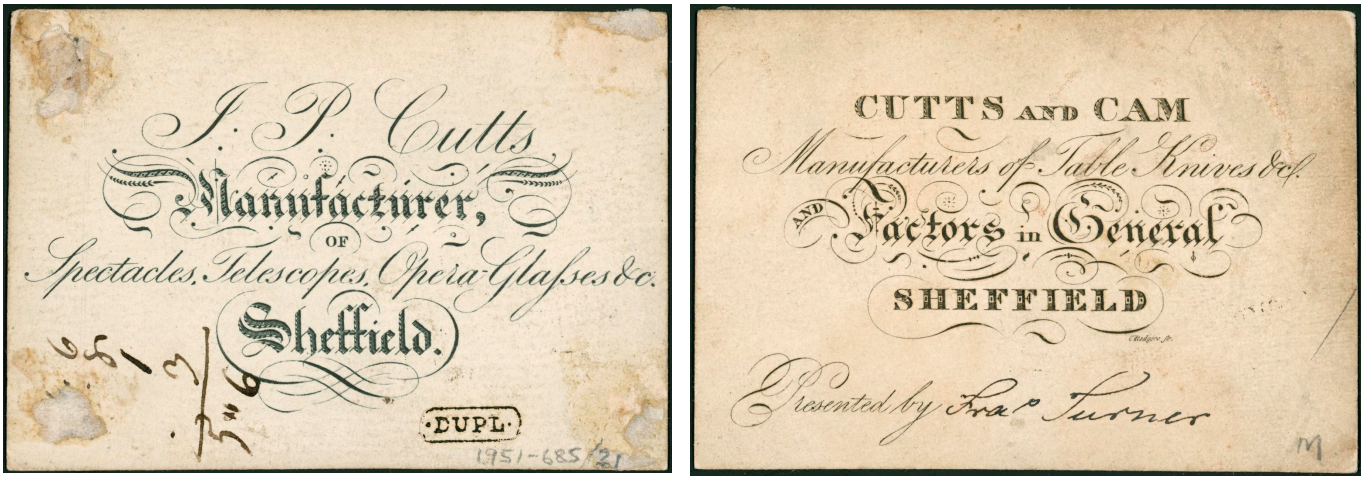

Figure 67.
Trade card for J.P. Cutts / Cutts and Cam (front and reverse), 1818.
Science Museum, Ref: 1951-685/21.

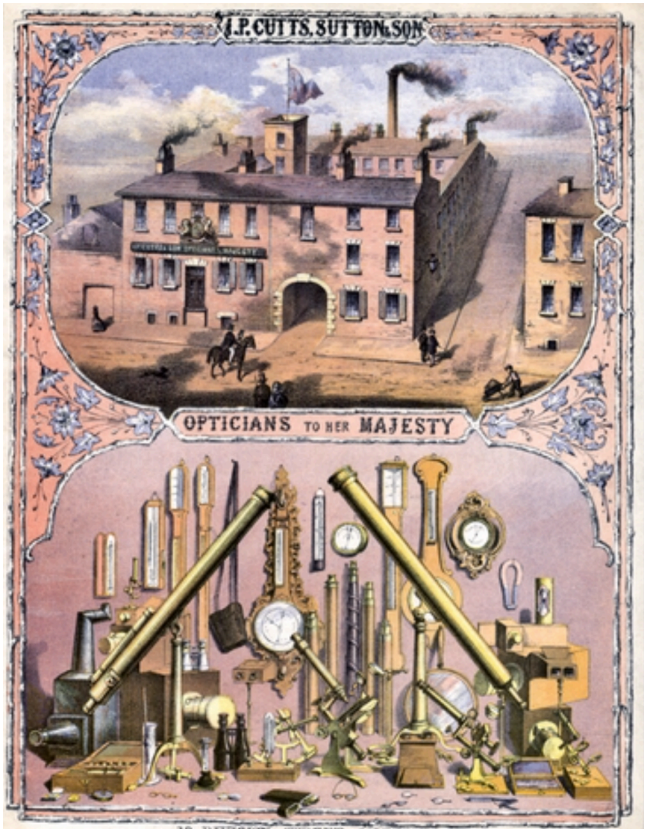

Figure 68.
Trade card for J.P. Cutts, Sutton, & Son, 1850-1865.
Sheffield City Archives, Ref: s09753.
Instruments shown include a Phantasmagoria Lantern, stereoviewers, and photographic cameras.



Figure 69.
Phantasmagoria Lantern, 1830-1865.
Phillip Roberts collection.
This is identical to the lantern shown in fig. 68.



Figure 70.
Compendium Magnifier by J.P. Cutts, Sutton, & Son, 1850-1865.
Albert Balasse collection.
With ‘Try Me’ trademark.

VII. Making the Improved Phantasmagoria Lantern

In 1821, this same integrated manufacturing process was applied to the Phantasmagoria Lantern and Copper-Plate Sliders. Hecht claims that 'Carpenter was the first to go about the production of lanterns and slides in a creative, business-like fashion, finding solutions to problems that had been dormant for years' (1993: 77). As already suggested, there is reason to be doubtful of Carpenter's exceptionality. He may well have introduced innovative practices to lantern production, but there is a long history of scientific instrument and small-object manufacture that sets him in a larger context. From the evidence at hand, it is far more likely that his practices were typical of the trades around him.

Comparing surviving lanterns to standard manufacturing practice, as described in the literature on the instrument trade (Morrison-Low 2007; Daumas 1972), we can establish the probable methods used in their production. It is a simple task to separate the different stages of manufacture that remain embedded in the physicality of an instrument. Each lantern has identifiable parts (lens, tube, chimney), materials (tin, brass, glass), and distinct preparations that would have been needed (firing glass, shaping rivets, moulding brass, rolling, folding, and welding tin). From these preparations we can infer a broader field of technologies and techniques. Each phase of production required an artisan with appropriate tools and training. The materials also suggest access to flint glass, tin deposits, and brassfoundries. Each implies a field of techniques and resources.

The material properties of each lantern unfold to reveal multiple infrastructures that must have been connected to the instrument makers' workshops. Knowledge of manufacture in nineteenth-century England can add valuable context to information of this sort, to set our material findings in a broader paradigm, in a specific place and time. Fragments of media history emit their own light. The material study of surviving objects reveals their production networks. They cannot show exactly how a manufacturer operated, but they very strongly suggest a landscape of agents and materials supporting the trade. If only dimly, the lanterns illuminate a moment in media history and point the way to further answers in the literature on industrial history. Existing literature provides a poor account of lantern manufacture because it relies on documentary evidence and tacit knowledge of collections. Close analysis of the riveted joins in a lantern's chimney tells us something of the places it has been, and the people that made it. There is much to learn from attentive examination of the surviving evidence.

Examination of surviving Phantasmagoria Lanterns (figs 1, 10, and 69) shows several distinct parts: japanned tin body, optics, brass and tin lens tube, and polished metal reflector.[51] Other versions may have rackwork-adjustable lens tubes and microscope attachments. These would have required distinct manufacturing tasks that could have been accomplished in Carpenter's workshop, or subcontracted to off-site employees or external businesses. As Carpenter was an optician, it is likely (although not certain) that the lenses were ground in his manufactory on Bath Row, which would probably have been equipped for this task. It is not clear if the lanterns used the very best lenses, reserved for microscopes and high-end instruments, or if they were made like the cheaply-put-out spectacle lenses. As for his spectacles, Carpenter could have employed semi-skilled labour to produce cheap lenses for large markets.

To have produced the volume of kaleidoscopes reportedly sold, he would have required his own workers, and a well-organised subcontracting and finishing operation. That he employed foremen (Westley and Fields) further suggests that he had a workforce. The small size of his manufactory and the evidence of his slide painters suggests that the majority of these workers were off-site—perhaps semi-independent practitioners, perhaps working for Carpenter exclusively—with Westley or Fields managing the ongoing processes and taking materials in for finishing. There is precedent for this in the Birmingham gun trade (Goodman 1967 [1866]; Williams 2009).

Sheet tin manufacture must have been subcontracted to one of the numerous metal dealers in Birmingham, who would have rolled and cut the metal for the body of the lantern, folded it, soldered it together, and added little flourishes—wire handles, ball-bearing feet, and springs for the slide stage. Every little feature was supplied by extended trade structures. The tin was japanned to protect against wear and heat, which would have required preparation and firing. As we have seen, japanning was performed by a workforce of anonymous women. The lantern could then have been fitted with optics and other components. Brass lens tubes would have been prepared by a professional founder. All of this follows the same pattern as the earlier Kaleidoscope.

With the individual components made, it would be a relatively simple matter to assemble everything in Carpenter's workshop. The reflector would likely have been cut

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[51] There are several variations on the Phantasmagoria Lantern in collections. This summation of Carpenter's manufacturing techniques is primarily based on examination of Philip Carpenter lanterns in the Museo Nazionale del Cinema, Hessischen Landesmuseum, and Toverlantaarn Museum, as well as later Carpenter & Westley lanterns at the Museu del Cinema, Cinémathèque Française, and Bill Douglas Museum.

and polished by a metalworker. Carpenter would have also purchased argand lamps and wooden storage boxes and had the accompanying booklets printed.

The lantern was designed for easy and cheap manufacture. Its very existence is enabled by the professional networks and infrastructures that support these various tasks. The Birmingham trades followed a system of manufacture based on artisanal labour, workshop organisation, and hand technology. But the lanterns were not made by industry, or the workshop economy, or labour (for these are descriptive concepts). They were made by living people with names and minds of their own. These people worked and slept in Birmingham. They knew its crowded streets and huddled buildings. They were professionals among jewellers, gunsmiths, and copper-box makers. Many trained their entire lives and took pride in their work. Some were flitting between subsistence jobs and ground down their fingernails for the lowest wages. For everyone, these manufacturing chores, as yet not even a footnote to media history, were their livelihoods and part of a complex physical, emotional, and intellectual life.

We have seen how a history driven by rich geniuses and revolutionary machines has neglected to record these people. We will never know the names of those who made the materials and components that changed history because no one ever thought to preserve them. It is likely that Carpenter did not know the names of most people in his supply chain. The drive to individualise history prioritises powerful individuals and their surviving archives. Working people are reduced to larger groupings that describe their relation to larger historical categories. In the absence of names, we may find common tendencies, practices, or experiences felt by many people. We may set absent people in visible spaces and structures. There is much more to find in the trade directories and archives and I offer this only as a schematic account of the media production networks and their practitioners. In the absence of a working-class archive equal to Carpenter's, we must look elsewhere for evidence.

VIII. Interlude: Spectacles and Obscurity

Sometime in the 1880s the Rector George Barnes boxed up a little pair of glasses and sent them to Carpenter & Westley for repair. Barnes lived many miles away in the small village of Somerton in Oxfordshire, but still decided to post his glasses to London, to be looked at by one of the most prestigious opticians in the country. Despite being mainly known for lanterns (by media historians) and microscopes (by instrument historians), it seems clear that one of Carpenter & Westley's principal trade was in spectacles.

Philip Carpenter's 1834 catalogue lists forty-six different kinds of spectacles and reading glasses (1834: 3-5). This was the most numerous category of everything he stocked, slightly more than the number of different available telescopes and microscopes, but much greater than his stock of lanterns and slides. A rare surviving paper receipt (fig. 71) shows that a Mr Fenwick purchased a gold eyeglass, with fancy pebble decorations, from Carpenter in 1824, while he was still working in Birmingham. The letterhead trumpets Carpenter as 'Sole Maker of Dr Brewster's Patent Kaleidoscope' and notes his production of telescopes, microscopes, and spectacles. The Phantasmagoria Lantern is not mentioned.[52] Carpenter himself outlines his spectacle business in an advertisement of 1827:

> PHILIP CARPENTER
>
> Respectfully informs the NOBILITY, GENTRY, and PUBLIC in general, that having been nearly thirty years engaged in business as a practical Optician, he is able to supply every article in the Optical way superior to most and inferior to none. P.C. wishes particularly to recommend his SPECTACLES and EYE-GLASSES, as being the very best that can be made: his long experience and the great attention he pays to the selection of the best and most suitable Glasses and Pebbles, justify him in asserting that those Ladies and Gentlemen who honour him with their command, will find the different imperfections of vision remedied by his Spectacles in a very superior manner. Persons residing in the country may have their Eyes properly suited, by sending the Glasses they have been accustomed to wear, or if broken, any small piece of one. Those who have not begun to use Spectacles may have proper ones by informing P.C. whether they can read the small print of a newspaper and at what distance. (1827: 26)

This is a curious notice as it suggests that Carpenter was targeting a clientele beyond his immediate local customer base. It is not known how successful he was, but by the 1880s at least, Carpenter & Westley were dealing with spectacle repairs from as far away as Oxfordshire. The reach of the spectacle business was noted by Mary Carpenter in her later years:

> We have an immense number of customers, especially in the country; so many letters and posting-boxes come in every morning and go out

[52] That the lantern is not mentioned may mean that this letterhead was printed prior to 1821, but not used until later, or it may indicate its relative unimportance to his business in 1824.

> every evening. Our spectacles have such a name far and near. (R.L. Carpenter 1878: 51)

This minor vignette of the Rector's broken glasses making their way to Regent Street emerges because of a chance encounter with a fragment of text pasted to the outside of a wooden box. As Mary notes, Carpenter & Westley provided small postal boxes for customers' glasses. So few of these boxes survive that it is unclear how common this practice was among opticians. One such box in my collection still has its tattered paper label extant, complete with Barnes' name and address, scrawled in his own handwriting (fig. 72).

Barnes is still known in Somerton, where a memorial hall, church plaque, and stained-glass window commemorate his time as rector of the parish, but he is not a significant figure in the histories of media, science, or technology. This chance survival presents a fragment of a person's life and gestures towards the many ephemeral events and anonymous lives that intersected with the instrument trade. We know that Carpenter must have repaired many pairs of glasses. But, in almost every case, we do not know who these customers were. The only reliable indicators that this practice took place at all are an advertisement, a reminiscence, and a tiny box used to transport George Barnes' glasses to Regent Street.

Figure 71.
Receipt for a gold eyeglass with pebble finish, written by Philip Carpenter, 1824.
Birmingham Library, Ref: MS1342/53.



Figure 72. Postal box and spectacles by Carpenter & Westley.



Postal box for spectacle repairs, c.1890.

Phillip Roberts collection.

With ‘memorandum’ instructions pasted inside, and user’s name and address pasted to exterior of lid: G.E. Barnes, Somerton Rectory, Banbury.



Spectacles and case, by Carpenter & Westley,, 1837-1932.

Phillip Roberts Collection.

IX. The Footprint of Women's Labour

There were many anonymous manufacturing practices taking place beneath the ground of media history. In many cases, a named maker is credited with manufacture, but this does not mean that they actually made the instrument in question. Carpenter employed a workforce. This included named individuals such as Robert Field and William Westley, but most remain anonymous. Timmins reports that the everyday business of lens grinding was not carried out by the master instrument makers, but by minor, unvalued practitioners:

> Women and girls are employed chiefly in the manufacture of spectacles, but as their share of the work is soon learned, they marry early, and are replaced by younger girls. The making of the light steel frames, now popular, and of the silver and gold frames too, employs men and boys, while the grinding of the glasses and the fitting up of the spectacles is frequently done by women and girls […] Although the workmen do not earn very high wages, their labour is light and well paid, and many of them set up as 'small masters', and carry on their own business at their own homes. (1967c [1866]: 535).

Doublet notes similar patterns:

> Women and children are chiefly employed to cut and edge these cheap glasses to the spectacle frames; and who could expect they should do them better for the price? (1850: 11)

This presents a tantalising glimpse into an obscure world of women's labour. There were many poor workwomen making lenses and parts and producing the vast bulk of Carpenter's output. This kind of semi-skilled labour seems to have been typical of the instrument trade, but it only emerges in scattered references across the literature. In a similar excursus, M. Billing notes of the Chadburn manufactory in Sheffield:

> The glasses are cut out of the required size with a diamond, and the corners are then nipped or broken off with pliers. This branch of the work is performed by females, and an experienced hand will nip or round from sixty to eighty gross per week. The glasses are then taken to the grinding room, where they are placed by women on concave or convex dishes. (1858: 30)

Women's labour was also common in the toy trades, where women and girls would stamp buttons and cut buckles and make all manner of small consumer items (Berg

1994: 276-279). Japanning was commonly carried out by women. For many tasks, women's labour was preferred. The delicacy of button-making was thought to be the province of women because of their smaller hands and the concentration they were presumed to have acquired through household needlework (Berg 1994: 277). Japanning required management of large stoves, typically operated by women transferring skills from domestic labour (Berg 1994: 277).[53] There is a considerable footprint of women's labour in the optical instrument trade. It is highly likely that the Phantasmagoria Lanterns were japanned by women and a good probability that their lenses were made by women's hands.

In the second half of the nineteenth century, women were commonly employed to produce lenses for the thriving spectacle market, but it is not clear how early this practice began. Carpenter definitely used artisanal division of labour methods. This may have included lenses for his spectacles and popular instruments, depending on the magnitude of his output (which is difficult to determine). Eighteenth-century opticians, who tended to make instruments to order, were more likely to have produced optical lenses themselves, or using a small-skilled workforce. But McConnell shows that in an earlier era of lesser production, lens-makers were still reliant on hired labour (2016). Even Cornelius Drebbel, one of the greatest of the seventeenth-century lens grinders, made use of anonymous labour. Nicholas Peiresc once noted that Drebbel produced his lenses by use of grinding machines; 'and that it was very easy because he had merely to set the machine up and leave a small boy to operate it, just looking in every three or four hours' (McConnell 2016: 53).

Anonymous labourers were everyday participants of an optical practice that is only partially revealed by the surviving historical record. A lantern, or a pair of spectacles, may survive as a physical testament to a moment in history, but they cannot tell the full stories of their owners and their makers. There are few detailed accounts of women in lens grinding, although Timmins, Doublet, and Billing show that they were definitely there. Reports of similar industries give some indication of working conditions and everyday practice.

Sophia Cockin worked as a cutter and grinder in the Sheffield cutlery trade. She started work at six years old, eventually setting up as a small master and employing a workforce of girls. She developed a cough and a pain in her chest, 'from the dust made by the lathe' (White 1865: 42; Pike 1967: 193-194), certainly also a danger to the lens

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[53] While women's labour was most common in the light manufacturing trades, they also worked alongside men in heavy industries when no lighter alternative was available. Women worked with metals—making nails, pins, wire, chains, and pen nibs (Berg 1994: 277-278; Hutton 1835: 192).

grinders.[54] Younger women were frequently employed as engravers for watchmaking, in one instance being driven out by striking male labourers, opposing the undercutting of their own wages by a cheaper workforce. The dismissed women 'immediately turned their attention to engraving on glass' (Wynter 1869: 269-270; Pike 1967: 201), adapting their skillset to a cognate manufacturing trade, as was common among all insecure labourers. Reflections on the lives of the manufacturing workforce is scattered across nineteenth-century literary discourse, in reports and travel narratives, often from the perspective of visiting middle-class observers. The everyday experiences of the people making the instruments and objects that still survive in collections are much harder to determine.

The ephemerality of the optical trade's many interlocking histories should encourage a certain caution when dealing with the extant historical record. Carpenter is very well documented, but the reasons that certain fragments of his life have survived should bear scrutiny. His lantern practice is well-known because there are many collectors interested in preserving its material fragments. The same is true of his microscope manufacture. The details of his supposed innovations have similarly entered media history because he published the details in numerous companion books (as other instrument makers had done) and because these books happen to have survived, partly through luck, and partly because Carpenter was considered significant enough in the nineteenth century to make them valuable texts. But his semi-obscure spectacle trade points towards a much larger field of lost practices that may occasionally be illuminated by an auspicious fragment. A single visible and documented paradigm may help us to understand a vast plane of unknown histories.

X. The Emergence of a Lantern Trade

The local manufacturing context was an important influence on Carpenter's production methods. This context is made visible by material evidence considered in relation to knowledge of workshop manufacture in Birmingham. Analysis shows how lanterns and Kaleidoscopes were assembled in modular fashion. With the Phantasmagoria Lantern, this extended to a modular business plan that established lantern hardware as a central element in a wider series, with interchangeable slide sets, microscope attachments, and literature.

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[54] Both glass and cutlery required cutting, grinding, and polishing. To grind a lens, a thickly cut disk of glass is worked against an abrasive surface (sand or emery in early lens grinding, later iron or bronze work tools). Once the correct curvature is ground, the lens must be polished using a mechanical lathe, or by hand (Charleston and Butterworth 1957: 229-237).

Both of these practices (modular manufacture and consumer packaging of goods) were more significant innovations than the copper-plate transfer printing celebrated by scholars. They heralded a more profound change in the manufacture and retail of magic lanterns. They provide compelling explanations for the success of the Phantasmagoria Lantern, and the subsequent expansion of the trade over the following decades. This historical moment sees increasing output potentials among the workshops of Birmingham intersect with changing attitudes towards science, greater prosperity among the middle classes, and an explosion of interest in curious novelties. These trajectories coalesced to present a commercial opportunity for scientific instrument makers, publishers, and popular scientists (and, further down the supply chain, for tinsmiths, brassfounders, glassmakers, lens grinders, and japanners). There was money to be made in optical media—as there was in printing, gilt toys, buttons, fancy fabrics, and mechanical novelties. These trajectories and commercial openings combined to establish the conditions for the emergence of a magic lantern trade.

There was now greater industrial organisation among the instrument makers, due to the expansion of manufacturing capabilities in metalworking and workshop production (Crouzet 1982: 246-249; Hopkins 1989: 25-39). Utilising new industrial processes, manufacturers could make more instruments than was possible before. Many opticians and instrument makers became producers of consumer goods and shifted into the emerging entertainment media trades. The intersection of a longstanding instrument trade with the explosion of manufacturing capability triggered by the industrial revolution allowed for new approaches to consumer retail. Toys and instruments could now be produced in greater numbers that at any time in history.

I have described the Improved Phantasmagoria Lantern, suggested probable use patterns, and explored the cultural and retail landscapes around it. I have challenged existing scholarship on Carpenter's innovations and argued that he is important as an indicator of changes across a broader network of practices, products, and trades. The Kaleidoscope enterprise shows how new approaches to optical media were discovered and explains why Carpenter should sell magic lanterns as consumer instruments. The publishers and toy makers demonstrate the importance of analogue trades. The Thaumatrope indicates how different curiosities were developed to fill existing markets. Changing attitudes towards science and wonderment, and the lantern's relationship with these concepts, explain why Carpenter presented his lanterns and slides as instruments for practical education, but also why they should retain an element of the fantastic.

Carpenter was not an inventor. There was a whole range of contextual factors and historical currents that intersected in the paradigms around him. He was certainly innovative, and for the visibility of his media practice he is difficult to overlook, but these structural and contextual pressures provide different explanations for the decisions that he made, and for the range of potential options open to him.

In 1826, Carpenter moved his business to Regent Street in Westminster (R.L. Carpenter 1878: 49; Roberts 2017). Over the next decade, practising lantern manufacturers began to solidify into something resembling a lantern trade. Carpenter and Birmingham both provide hyper-visible examples of consumer media and small-object production. We know that there were other manufacturers, and other cities. We have encountered Blunt, Scott, Ackermann, Phillips, Schmalcalder, Bate, Ruthven, and others. Sheffield, Manchester, Liverpool, London, Paris, and Nürnberg were all contemporary centres of instrument making. Similarities and differences in practice are difficult to determine, and will require further research. I can only point to the footprint of Carpenter's media practice, drawn from the evidence at hand, and offer this as a basis for research on the emerging lantern trade and its relationship with industrial and commercial history. I have shown that Carpenter's success, and the growth of a more profitable trade in magic lanterns and popular media instruments, was driven by a range of extensive networks and economic factors. The early decades of the nineteenth century established the manufacturing and retail infrastructures that made a popular trade in optical media possible. The next phase of the lantern's history concerns the individuals, institutions, and structures that made it ubiquitous.

Chapter 7.

Itinerancy and Working-Class Lantern Culture

I. The Other Side of the Media Revolution

Working-class people made the magic lantern. They rolled its tin, ground its glass lenses, and pulled its brass tubes. They did not sign their names to it, leaving a helpful space for the marks of the prestigious instrument makers. Through their labour, the working classes powered the media revolutions of the 1810s and 1820s and laid the foundations for a new trade in domestic media instruments. They established the conditions for the great instrument makers to accumulate fortunes and for later nineteenth-century culture to find new ways of making, distributing, and living with images. But despite their essential contribution to the story of the lantern, they remain overlooked by media historians.

Most scholarship implies (intentionally, or by omission) that lantern culture was uni-directional. Wherever the working classes feature in the literature, they are consumers of middle-class projections. Poor audiences were subject to religious sermonising or temperance propaganda (Vogl-Bienek 2016; Eifler 2017). A recent collection on the social history of the magic lantern, contains no research on working-class contributions to lantern culture (Vogl-Bienek and Crangle 2014). The one context where active poor lanternists are admitted is the semi-mythical itinerant lantern culture of the eighteenth-century—the world of the Savoyards and Galantee Men (Gonin 2010, 2016; Rossell 2008: 102-140; Mannoni 2000 [1995]: 77-83).

Some research on these figures is based on rare surviving materials once used by poor travelling lanternists, but much is drawn from the reports, literature, prints, and artworks of middle-class observers. This has resulted in a tendency towards romanticism that undermines our knowledge. Rossell has gone some way towards challenging this persistent class voyeurism by drawing attention to both impoverished

and romantic iconography, but much source material remains within the lens of the privileged observer. Evidence of living social history remains scarce.

But it's there. Rossell and Gonin present precious surviving objects once owned by wandering lanternists. Timothy Toddle, writer of the discovered lanternist's notes (1990 [1841]), was very probably a lower, though not destitute, performer. Mayhew interviewed a number of practitioners looking back on an older performance tradition. And there are voluminous writings by working-class people that, if not able to reveal the specific contents of lantern shows, can present the cultural soil of a working-class visual and performance culture. The tapestry of documentary sources gestures towards this darkness in the history of the lantern. Like domestic exhibition, working-class and itinerant lantern culture must be found in fragments, gestures, and absences. The fragments that exist show that lanterns, peepshows, microscopy, puppetry, and shadowplays burrowed into a longstanding culture of market, fair, and street entertainment. Lanternists lived among street singers, pedlars, costermongers, and fairground shouters.

But at the beginning of the nineteenth century, amidst the Napoleonic wars, the industrial revolution, migration, depression, and their combined aftermath, popular culture was stricken and changed by new conditions of living. Longstanding folk traditions were transformed in the new urban environments, or strangled by new economic relationships. Working-class people may have generated the labour that transformed lantern culture, but they were not served by the newly emerging trade. The Phantasmagoria Lanterns were consumed by the rich. There are numerous reports of itinerant performers being unable to compete in the new market; squeezed out by neater lanternists and retailers. An old showman complained to Mayhew: 'When we started, magic lanterns wasn't so common; but we can't keep hold of a good thing in these times' (1851 [Vol. 3]: 73-74).

This is the other side of the emerging lantern trade; its implications for a people not well served by high-class retail networks, prestigious exhibition venues, and inattentive historians. The absence of working-class voices is barely registered in the existing literature. There is such little attention to unequal power dynamics in the recording of history that Carpenter and his contemporaries have been taken as representatives of a culture at large. We have seen how this was not the case.

Such inattention leads to the severing of different eras. I have shown how other scholars present disconnected moments in place of multiple, shifting histories. There is far less connection between the Savoyards, the Phantasmagores, and the professional retailers than Barnes, or Ceram, or Mannoni would have us believe. The reason for the

disconnect between itinerant culture and the emerging nineteenth-century trade is because they operate in different class strata. One era did not develop into the next on a linear timeline. In actual fact, the lantern trade swept away the former cultures of itinerancy by making it impossible for poor lanternists to compete with industrial quantities of consumer lanterns. One paradigm emerged as the other collapsed. The wonderment of the travelling lantern was eaten by the banality of consumerism.

Carpenter's marketing literature orchestrated a cultural revision of the value of working-class lantern performance, denouncing its 'miserable caricatures and grotesque figures' (1990 [1823]: 125). Later, J.S. Coyne described the Galantee Show as 'the degenerate predecessor […] to the modern magic lantern' (1858: 609; Herbert 2000: 243). Recognising the discursive framing of the new rational entertainments, a puppet showman told Mayhew:

> To the sentimental folk I am obliged to perform werry steady and werry slow, and leave out all comic words and business. They won't have no ghost, no coffin, and no devil; and that's what I call spiling the performance entirely. It's the march of hintellect wot's a doing all this—it is, sir. (1851 [Vol. 3]: 45)

Economic transformation was justified by supposed moral virtue, as a working-class lantern culture died.

This chapter will explore the shifting ground of the lantern worlds. I will show how the emergence of the nineteenth century's new media networks undermined the cultures of itinerancy that had existed before. Challenging perceptions of the itinerant lanternist as romantic other, established by the nineteenth-century middle classes and perpetuated by modern historians, I will show that itinerancy, and the working-class lantern cultures that it cultivated, was built on a powerful economic structure of trade networks and transnational communication. The itinerants and pedlars formed a shadow economy that had built up over centuries. The declining viability of this mode of business was a result of industrial transformation, the rise of sedentary retail, and the weakening of migrant commercial networks at the beginning of the century.

The grievances identified by showpeople were the audible voice of an underlying economic shift that simultaneously strengthened emergent modes of trade and weakened longstanding migrant economies. I will trace the terminal decline of this form of lantern culture and reveal some of its dying stories. The itinerants plugged into the labour networks of the new industrial populations and articulated problems and aspirations of the working classes at a turning point in their history. Other scholars, unwilling to explore the class implications of lantern technology, have failed to note the

graveness or radicalism of the poor lanternists. Blinded by the light of an emerging liberal capitalism, by ideologies of free competition, invention, and technical evolution, few have noticed that something valuable was lost. The emergence of the nineteenth-century lantern trade was founded on a moment of extinction.

II. Mayhew and the Lanternist

'Times are changed, and all for the worser' (Mayhew 1851 [vol. 3]: 73). Mayhew interviewed a street showman sometime in the 1840s. This old lanternist, 'a short thick-set man, with small, puckered-up eyes, and dressed in an old brown velveteen shooting-jacket' (1851: 73), described his days as a travelling entertainer and how the lantern business had changed. He has a melancholy tone as he tells Mayhew how the old routines no longer attract crowds as they once did:

> A month before Christmas […] we went with a galantee show of a magic lantern. We showed it on a white sheet, or on the ceiling, big or little, in the houses of the gentlefolk, and the schools where they was breaking up. It was shown by way of a treat to the scholars. There was Harlequin, and Billy Button, and such-like. We had ten and sixpence and fifteen shillings for each performance, and did very well indeed. I have that galantee show now, but it brings very little. […]
>
> When we started, magic lanterns wasn't so common; but we cant keep hold of a good thing in these times. It was a reg'lar thing for Christmas once—the galantee shows. (1851: 73-74)

The old man's shows were typical of a long-practised form of travelling lantern entertainment. The Galantee Men and the Savoyards travelled Europe throughout the eighteenth century, exhibiting attractions at fairs, on the streets, and in the homes of paying customers.[55] These lanternists used little tin bullseye lanterns, bought from the instrument makers of Nürnberg and London (Rossell 2003) and exhibited with handfuls of painted slides (Gonin 2016). The itinerants would sing in the streets to advertise their wares and show curious scenes on walls or improvised fabric screens.

The *Penny Magazine* recalled in 1845:

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[55] Often designated 'Savoyards' as a blanket term, the itinerants could come from any poor district in Western Europe; as Rossell says, anywhere 'where a hard life of precarious existence on the road offered hope beyond the certainty of endless impoverishment' (2008: 102). Regions known to have produced many travelling entertainers included Savoie, Auvergne, Piemonte, and Wallonie. Women were also itinerant entertainers (Rossell 2008: 115; Robinson 1993: 18; fig. 75), despite the widely-applied term 'Galantee Man'.

> They generally carried a hand-organ as well as their magical box. Their cry, which still rings musically in our ears, was—'*Galante So! Galante So!*'—*Galante* being good Italian for Gallant, or brave, or *fine*, and *So* being their pronunciation of our English word show. ('Magic Lantern at Rome' 1845: 101)

The Galantee Men conjured monsters, presented satires, and poked fun at the monied or the powerful; they illustrated topical events, popular stories, and amusing jokes (fig. 73). 'The designs on their slips of glass were for the most part exceedingly grotesque; and their own personal appearance was scarcely less so' (1845: 101). Performances were structured around sketches and short stories (fig. 74), presented with improvised descriptive commentaries, songs, or humorous patter. The magic lantern was one of many attractions that also included peepshows, hurdy-gurdies, and dancing marmosets. They are depicted in numerous illustrations (fig. 75), variously shown as romantic figures and wretched paupers (Rossell 2008: 102-122). Cruikshank and others commonly illustrated them as grotesque, shady, foreign figures, and numerous writers followed suit. For a century, the itinerant entertainers were the most visible symbol of the magic lantern, and most people's only contact with the device.

We find the itinerants scattered about the pages of journals and chapbooks, popular prints and broadsides, faces thick with dirt, mouths cottoned with the coarsest language (rarely repeated—we are simply told it is coarse). The visions that these lanternists raised were the ghosts of an imagined past; of mythic street entertainers and shared pleasures.

Nineteenth-century recollections abound. In *The Magazine of Science*:

> The galanty show seems as it were engrafted in our earliest recollections of Christmas frolics. The grotesque figures—the terrific phantoms—and the magnificent processions displayed 'all on a white sheet', took too early and too vivid a hold on our fancies to be easily forgotten. ('Magic Lanthorn and Phantasmagoria' 1839: 17; Herbert 2000: 213).

And in *The Annals of Literature*:

> But we still have the galantee-showman, wandering up and down our streets and squares,—with his musical prelude and tempting announcement, sounding through our warm rooms, to display the shadowy marvels of his mysterious box, to the young group who gaze in great wonder and some awe. (W.G.C. 1836: 424)

We have already seen how literary depictions of lantern shows, such as *Sergeant Bell and His Raree Show* (1839) or *Paul Pry's Magic Lantern* (n.d. [c.1840]), make others of the itinerants.

The itinerant lanternists produced visions that were marvellous or wondrous or terrific, but rarely terrifying or unsettling, as the Phantasmagore's ghosts were. This is because of the different commercial relations that dominated the Galantee Show. These were poor folk performing for both rich and poor. They were considered rogues, and their satirical commentaries could be biting, but they did not disrupt their audience's understanding of the world. They sold wonder for a world unseen. In this age of non-reproducible images the lantern brought people into contact with famous characters and distant lands that were in the minds of educated observers, but were barely ever visible. Among these images the lanternist would insert grotesques and comic figures.

> On a Twelfth night, in 1818, a man making the usual Christmas cry of '*Gallantee show*', was called in to exhibit his performance for the amusement of my young folks and their companions. Most unexpectedly, he 'compassed a *motion*' of the *Prodigal Son*; by dancing his transparencies between the magnifying glass and the candle of a magic lanthorn, the coloured figures greatly enlarged were reflected on a sheet, spread against the wall of a darkened room. The prodigal son was represented carousing with his companions at the Swan Inn, at Stratford; while the landlady in the bar, on every fresh call, was seen to score double. There was also Noah's Ark, with 'Pull Devil, Pull Baker', or the just judgement upon a baker who sold short of weight, and was carried to hell in his own basket […] The gallantee-showman narrated with astonishing gravity the incidents of every fresh scene, while his companion in the room played country-dances and other tunes on the street organ, during the whole of the performance. The manager informed me that his show had been the same during many years, and, in truth it was unvariable; for his entire property consisted of but this one set of glasses, and his magic lanthorn. (Hone 1823: 230-231)

This passage, by the publisher and performer William Hone, contains a miraculously surviving name for its Galantee performer. Hone reports that he was given a trade card:

> He put his card in my hand, inscribed "The *Royal Galantee Show*, provided by Jos. Leverge, 7, Ely Court, Holborn Hill" (1823: 231).[56]

The itinerant lanternists peddled a form of optical knowledge made into capital. They peddled themselves; their own considerable personalities and the (sometimes fictional) grotesquery of their social strata. But things were changing in the nineteenth century, as Mayhew's showman tells us. By the time of his interview with the old man, the lantern had shifted from an unusual instrument—something that showpeople would present to crowds, but not often seen in everyday life—to an established consumer device. The precariousness of their situation meant that the Savoyards and Galantee Men would be hit hard by the coming waves. Economic depression and changing modes of entertainment conspired to drive the lanternists out of business.

By the 1840s the lantern had become a children's toy and a curiosity for the dilettante. It was still exhibited by professional entertainers, but these were now sophisticated artists and celebrity lecturers; they used expensive apparatuses to compete in a crowded market for popular attractions. The old showmen—travellers, continually reproached for their vulgarity and crudity—could no longer compete and faded away (Mannoni 2000 [1995]: 102-103). 'They have entirely disappeared from our streets', says the *Penny Magazine*, 'and their nocturnal cry, we believe, is no longer heard anywhere in England' (1845: 101). The popular face of the magic lantern had changed, and with it, the possibilities for seeing a life and a world beyond one's own had begun to shift. 'Their usual cry was not "Who will see the Magic Lantern?" but, "Who will see the New World—*Chi vuol veder il Mondo Nuovo"'* (1845: 101).

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[56] Note that this performer had both a trade card and an address. He was clearly not the homeless Savoyard of legend.

Figure 73. Eighteenth-century slides in the Galantee style.

Typical performances may present monstrous visions, satirise societal types, diagnose social problems, or illustrate famous events.



Grotesque figures, c.1790. National Science and Media Museum, Ref: 1990-5036/11527.



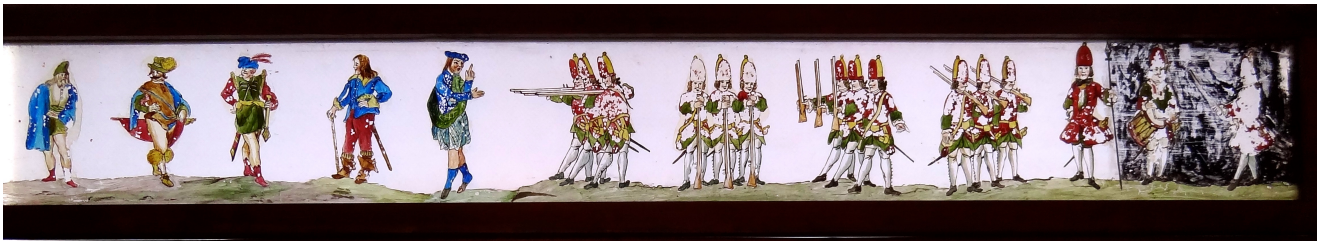
Callot dwarves, or Lilliputian figures, c.1790.
National Science and Media Museum, Ref: 1990-5036/11452.
Satirical caricatures in the style of the French engraver Jacques Callot, after engravings in *Il Callotto resuscitato* or John Bowles' satirical prints in *Humours of the Lilliputians*.



Callot dwarves and monkey satires, c.1790.
National Science and Media Museum, Ref: 1990-5036/13194.



Destitute figures, c.1790. National Science and Media Museum, Ref: 1990-5036/11524.
After engravings by Jacques Callot.



The Jacobite Rebellion of 1745, c.1790. National Science and Media Museum, Ref: 1990-5036/11525.

Figure 74. Slides illustrating short humorous sketches.



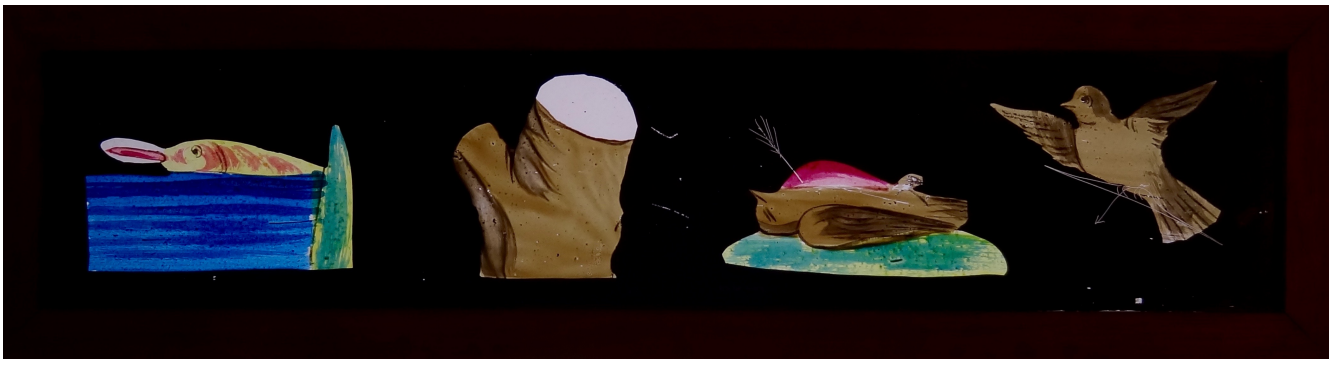
Animal Sketches, 1838-1854. National Science and Media Museum, Ref: 1990-5036/13192.
Comic animals dressing and behaving as humans, by Andrew Pritchard.



Guy Fawkes, c.1830. National Science and Media Museum, Ref: 1990-5036/13901.
The guilty Guy Fawkes is ceremoniously carried to the scaffold, where he is hanged and burned.



Pig sketch, c.1830. National Science and Media Museum, Ref: 1990-5036/13913.
A comic sketch about a man riding a pig through town, causing much tumult.



Cock Robin, c.1830. National Science and Media Museum, Ref: 1990-5036/13896.
Illustrative views to accompany the comic song Who Killed Cock Robin?

Figure 75. Illustrations of Savoyards, or Galantee Men.



The Show-man, c.1800.
National Science and Media Museum.
Lithograph of an itinerant peepshow operator, by Isaac Cruikshank, after George Moutard Woodward.



L'Orgue de Barbarie, 1737-1746.
MET, Ref: 399121.
Engraving of an itinerant lanternist, by Anne Claude de Caylus, after Edmé Bouchardon, from *Etudes prises dans le bas Peuple où les Cris de Paris* (Bouchardon 1737-1746).



La Lanterne magique, par Schenau, 1765-1800.
National Science and Media Museum.
Coloured engraving of an itinerant lanternist, after Johann Eleazar Schenau.

III. Networks of Itinerancy

There are copious resources on the itinerants, as Rossell, Gonin, and Mannoni show, but the vast majority of the illustrations, recollections, and picaresque stories come from the perspective of middle-class observers. These voices reduce people to clichés of poverty. They express the illicit thrills of coming into contact with lower-class people, often projecting astonishment at the Galantee performers themselves as much as at the images or stories they presented. One 'new world' that the itinerants always carried with them was their own migrant lifestyle. To a middle-class audience they carried connotations of romance, adventure, or unease.

But these perceptions are one-sided, romanticised or censured, visions of lower-class life. They make the itinerant life a matter of aimless wandering and much lantern scholarship perpetuates this. Most historians are not so prejudiced as earlier writings, but still they reproduce uncritical images of tatty wandering lanternists. Itinerancy was not an adventure, it was a business. It was built on a developed economic network of merchants, performers, and tradespeople that has been ignored by media scholars.

This is made clear by Laurence Fontaine (1996 [1993]), whose research on itinerant cultures overturns persisting untruths prevalent in media history. Fontaine shows that itinerants (including merchants, tradespeople, and performers) were never rootless vagrants; they were firmly tethered to the extended economies of their home territories. Many marginalised mountain towns along the Alpine curve, in the Pyrénées and Cantábricas, the Welsh mountains and Scottish Highlands, operated migrant economies wherein travelling merchants and businesspeople made money abroad to be sent home to support families and communities. They developed advanced communications and commercial networks that spread across Europe, but remained rooted in the mountains. Familial ties, business associations, chains of credit, and sites of production connected the itinerants to each other wherever they travelled. Their history, as Fontaine discovers, was twofold. They were at times embedded in lowland town and village life, appearing intermittently to trade, or entertain, but all the while part of an invisible structure that enabled their migrant practice.

The itinerant lanternist was supported by a vast infrastructure of fellow migrants. They were not only escaping hardship, but contributing to a longstanding migrant economy. As such, through Fontaine, we may sketch a response to Rossell's problem:

> Just how this group of hardy perambulators […] came to flood across the European continent, and how they came to specialise in magic lantern shows, peep shows, and mechanical organs is something of a mystery to this day. (2008: 107)

There was certainly something in the poverty and politics of places like Savoie, as he suggests (2008: 107-108). But more than this, they were part of a vibrant economic system that exploited colliding cultures of sedentarism and migration across Europe. The mobility of the itinerants, and the robustness of their economic networks, made them uniquely placed to profit from the circulation of products and ideas. They were pulled abroad by money, but, in many ways, they never left their home communities.

The itinerant networks were built on longstanding cultures of mercantilism established in the fifteenth century.[57] Fontaine uses surviving records of merchant families to unveil their typical structures:

> The peddling networks were organised around two mainstays: first, the formation of far-reaching family networks, with a common place of origin, who married amongst themselves and were supported by a family banking system; and second, complete coverage of the market through setting up warehouses and city shops and using village manpower. (1996 [1993]: 22)

Typically, the network was headed by a leading merchant, someone with sufficient capital to act as guarantor for numerous smaller businesspeople. They flitted back and forth between home village and commercial outposts and speculated on new manufactories and warehouses. They may also have managed facilities of banking for the group. Below them were numerous localised business leaders residing in different outposts, often with citizenship, or legal right to practise in the local markets. They managed acquisitions, manufacture, and distribution around major marketplaces or trade intersections. They each managed several apprentices and substantial numbers of packmen, who would sell goods around local markets and villages. This longstanding system became better integrated into the lowland economies in the later eighteenth century, with many businesspeople setting up in their commercial outposts permanently, investing in local manufacturing economies, and more formally engaging with local sedentary businesses (1996 [1993]: 38-43)

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[57] Fontaine's research crosses western Europe, following people with little regard for national boundaries. She deals particularly with France, Italy, the Netherlands, and England, following Alpine and Highland pedlars around their business networks. Much of her evidence is drawn from French and Italian archives, but her conclusions are transnational, emphasising continental itinerant networks crossing into England and Scotland.

In every era, the packmen were not individual wandering merchants (many did not even travel very far); they were part of a solid local and international merchant network. One warehouse could supply an entire region of packmen, as is revealed in the archive of a Fribourg merchant called Antonio Rivolta—when granted citizenship he was required by law to denounce the practice of the foreign pedlars, which he did, but an inventory drawn up after his death shows that he continued to supply pedlars covering the surrounding countryside with fancy goods (Augel 1971: 195). Similarly, inventory documents show that a merchant of Paris called André Masson paid the fines imposed on minor pedlars from his home village (Fontaine 1996 [1993]: 18). There was a clear hierarchy in place to manage and support itinerant salespeople. Even independent traders were reliant on access to the networks for stock, typically leveraging family connections or prestige for credit from more established merchants (1996 [1993]: 74-76).

Fontaine identifies a large body of archival literature showing towns and guilds complaining about the web of mountain-born businesspeople, claiming that they resisted integration into local communities and that they refused others the benefit of their distribution networks. These complaints, as Fontaine suggests, 'revealed the links which bound the wealthiest to those who could offer only a limited amount of craftsman's knowledge, or who had nothing more than a bear or marmot to exhibit' (1996 [1993]: 20). Or, we might add, nothing more than a magic lantern.

Itinerant lanternists were more or less well attached to the trade and credit networks. Many sold cheap glasses and instruments and were integrated into the lower instrument-making networks (Rossell 2008: 110). Inge Keil has found evidence of the Augsburg instrument makers producing lanterns, peep shows, and camera obscuras for the Savoyards (2000; Rossell 2008: 110-112). From such merchants, they could stock spectacles for sale on the road and at fairs, or prepare travelling performances. One Augsburg optician, Berkenstein, was reported to have sold 'an entire showman's passage' (Rossell 2008: 111).

Some of these figures may have been destitute—perhaps cut off from sources of credit or otherwise tenuously attached to the networks, perhaps blind, or without family or village ties.

> For these pedlars, who were half-beggar, half-tramp, more important than the goods was the act of selling itself. They put on a show and sold entertainment and dreams. As intermediaries between their public and other worlds, they took their audiences into the realm of the imaginary,

> into other ways of knowing oneself, to other places, and to new understandings. (Fontaine 1996 [1993]: 81)

Reports of lanternist's patter suggest that the performers were conscious of their role in unveiling 'visions', or 'new worlds'. Such attention to immaterial content may have been because they had little of material value to sell, due to their lack of attachment to material distribution networks. Others, like the blind pedlars of Spain, could not even afford a small stock of chapbooks or a magic lantern, and so 'turned themselves, like living calendars, into heralds of forthcoming saints' days' (1996 [1993]: 81; Baroja 1969: 61). More comfortable itinerants might have some few goods to sell, such as spectacles, toys, or printed literature, 'and to sell them they would play out the peasants' dreams and expectations' (1996 [1993]: 81). Itinerant performers were not of a different type to other mountain pedlars. There were intersections of wealth and privilege among them, depending on access to support networks and credit, but they would all, to varying degrees, exploit their own universe of cultural signifiers. They themselves constructed the mythic Savoyard icons as a moneymaking opportunity.

> Ultimately, the pedlar was selling himself and all that his words—spoken or sung—could stir in the imagination of their listeners. They were not seeking one-to-one contact with the purchaser, nor the intimacy of the home, but the public square, the fairs, places where people passed through, times of festivity when a crowd might form around them, might share values other than those they lived by, vying with each other to attain this difference. (1996 [1993]: 81)

Following Fontaine's work on the structural foundations of itinerancy, we can better understand the networks in place to enable the Galantee Show as a social activity. These were consciously built economies, with common business practices in place to maximise profit-making potential. These networks also better explain the decline of the itinerant lanternists. There are numerous voices to indicate that the Galantee Men struggled to compete with new forms of lantern retail in the nineteenth century, along with criticisms of the vulgarity of itinerant performance culture that suggests shifting cultural attitudes.[58] Already in 1749, Abraham Gotthelf Kästner, was diagnosing the dissonance of itinerant spectacle and scientific rationalism:

> Nobody takes the Savoyards with their magic lanterns for an example of an experiment-making naturalist; for their plaything is old and coarse: a

[58] Media scholarship does not note that there was also much comment on the disappearance of itinerant tradesmen in general. This was not isolated to performers (Alexander 1970: 61).

> portable electric machine would give him more respect, but only for a short time. (Rossell 2008: 139)

Such declarations paint the changing lantern culture as a matter of popular tastes, but they are only surface ripples of deeper tectonic shifts. What changes the longstanding cultures of itinerancy, as Fontaine shows, are the looming economic, political, and industrial monsters at the turn of the century.

Political turmoil in France, growing radicalism and unease in England, the Napoleonic Wars, the continental blockade and economic depression shattered the communication and distribution networks of itinerancy. New import restrictions and tariffs hindered transnational business and religious and political persecution unpicked the underlying structures of peddling. 'The large merchant firms disintegrated in the agonies of revolution', as Fontaine apocalyptically puts it (1996 [1993]). Such disruption had occurred every fifty years or so, through various European wars or political shifts. But unlike the thirty years war, or the revocation of the edict of Nantes, this most recent series of disruptions coincided with new patterns of business, able to fill the gaps left by decreasing numbers and effectiveness of itinerant salesmen. Lancashire mills and midland workshops were poised to replace the older distribution patterns with networks of their own. Traveling salesmen continued to operate throughout the century, but the traditional networks were supplanted by new ones (1996 [1993]: 92-93; Davis 1966: 242-243).

IV. Documents and Slides

The itinerants performed at fairs, on streets, and in the parlours of the rich. There are many prints and reports depicting affluent families paying a raggedy lanternist to conjure visions. The Abbé Gaultier's *Amusing and Instructive Conversations* has a group of wealthy children responding to an itinerant's cries as another era might do an ice-cream van:

> Now, we *must amuse* ourselves this evening. What shall we do, William, to divert your cousins? Ah, listen! I hear the Magic Lanthorn.
>
> Ah, mama, let us see it.
>
> So you *shall,* my dears. *Tell* Betty to call the Savoyard, or man that *shows* the Magic Lanthorn. (1800: 55).

Gaultier's lanternist presented a series of dreary moralistic caricatures: Master Idle, Miss Sweet-Tooth, Master Foolish-Head, and Little Francis, who will never recover from a tumble out of a tree (1800: 56-60). Elsewhere, in contrast, the Galantee Men were

thought ‘too coarse for private representation’ (Bennet 1861: 116). In either case, the imagined lanternists were middle-class fantasies of the worthy or vulgar lower classes.

But the living Savoyards did not perform only for the rich. There are fewer stories and illustrations to attest to the fact, but lanternists were also part of working-class visual culture. We may find evidence of working-class storytelling cultures at the margins of the documentary evidence. We may look to the stories, reports, and caricatures for information to illuminate marginal lanternists. And there were chapbooks and broadsides, cheap printed papers sold to circulate songs and stories. These provide working-class voices that often show remarkable contiguity with magic lantern stories. Many lantern stories of the itinerant era also appear in these documents. Contiguity of stories and themes between these two forms of media can add voices to silent lantern images. There are few trustworthy accounts of poor lanternists, who appear twisted by middle-class reformers and ideologues, but the broadsides, reports, and documentary scraps provide examples of identical stories and similar repeating themes circulating among working-class communities. They present a powerful and radical performance culture.

V. Itinerant Tales From Surviving Slides

Tucked between two beams in the roof of an old postal coaching inn, in Lanobre, by the Auvergne border, Roger Gonin found a magic lantern (fig. 76). This was a very special lantern, missing its lens tube, its tin body partly eaten by rust, but still set in its wooden carry case, and still living with a set of slides. This was a real surviving itinerant’s lantern; confirmed by comparison with numerous illustrations (fig. 77). The wooden case doubles as a backpack that we have often seen strapped to the back of a travelling lanternist. Gonin (2010: 103-104, 2017: 38-41) and Rossell (2008: 133-135) have both described this lantern in exhaustive detail. I want to look at the content of the surviving slides, which offer rare examples of confirmed itinerant stories.

Gonin’s research suggests that this lantern was in use around 1820 (2010: 103-104), during the final cycle of itinerant lantern culture. There are ten slides in the set, although one is so badly damaged as to be now unreadable. The remaining slides illustrate animals entering the ark, a royal procession, a battle, comic figures, a hunt, a duel, Napoleon’s campaign in Egypt, a libertine story, and a political allegory (Gonin 2010: 104-106, 2016: 42-63).

Some of these slides were fairly common, later becoming staples of the later nineteenth century. The mechanical ark slide is interesting because it confirms the

Galantee Show seen by William Hone as, at least partially, factual (1823: 230-231). Both the ark and the just judgement upon a baker, described by Hone, are illustrated by surviving slides and must surely have been common. There are similar processions towards the ark in early slides held by the Museo Nazionale del Cinema and Cinémathèque Française (fig. 78). The story of the Prodigal Son presented to Hone may even have looked something like the libertine slide found by Gonin, as the 'parabole de l'enfant prodigue' was often depicted thus in French prints (2016: 62-63). It is likely, then, that Joseph Leverge of Holborn Hill was once an actual lanternist, and clearly not a destitute one. Perhaps he had become sedentary in the final days of the Galantee Men; perhaps he was unusually wealthy.

These slides confirm that some stories from the literature were based on real Galantee slides. But, if we take the literary view of itinerancy as our barometer, some of these slides are very unusual. I have found few written accounts of itinerancy that highlight such political content.[59] One slide presents grotesque caricatures of aristocrats. Another shows the 1807 battle of Eylau, in which the French fought the Russian and Prussian armies (Rossell 2008: 123). There is a slipping slide, showing three generals collecting the riches from Napoleon's 1798 Egyptian campaign (fig. 79). The end of the glass slipper is now broken, but Gonin shows that it would once have carried the angel of victory, which flew above the pyramids and crowned Napoleon in a laurel wreath (2016: 43-44). In 1820, this slide would not have constituted a dispassionate retelling of recent history.

Gonin hypothesises that these slides were a form of Napoleonic propaganda (2016: 64-65), but I think this is evidence of a different sort of visual politics. I see no reason to think that they were supplied by government to spread pro-republican sentiments, as Gonin suggests (2016: 64), nor that the slides were unaffordable to itinerant lanternists. As Fontaine shows, many itinerants had greater access to capital than we may expect. These slides more likely indicate the persistence of pro-republican sentiment in the post-war years, which remained strong in rural France and even among some of the working classes in Britain. The image of Napoleon anointing the Egyptian figure would have been read as him bestowing Egypt with the intellectual and moral legacy of the republic. In the years of post-war political repression it would have been incendiary.

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[59] Mannoni shows that the revolutionary period was also full of political lantern stories (2000 [1995]: 98-103), but his sequential methodology makes it seem as though this was unique to this moment. The lantern remained a symbol of class warfare into the early decades of the nineteenth century. It did not become more sober and peaceable as the fire of the revolution passed. The lanternists themselves were slowly replaced by other, more respectable performers.

The remaining allegorical slide is astonishing (fig. 80). It shows George III in chains at the hands of the Quadruple Alliance of Russia, Denmark, Sweden, and Prussia, with William Pitt standing behind. There is a seascape with an angel above, blowing a trumpet and carrying a banner marked: 'Liberté des Mers'—Liberty of the Seas. On a further bank there are four caricatures representing Africa, the Americas, Asia, and Europe, all celebrating the removal of Britain's naval power. Gonin has discovered a source illustration (2016: 58-62), with annotations that confirm the allegorical content of the image. It is not clear how this connects to the republican and anti-aristocratic sentiments of the other political slides. Perhaps, the lanternists' commentaries were not particularly sophisticated and they depicted only topical or historical events for curiosity's sake. Perhaps audiences were highly politically aware and would have understood how the slide referenced Napoleon's support for the Northern European powers against British maritime trade. Much depends on the kind of audience watching. Closer inspection reveals that George III is tied to an anchor, ready to be drowned by the kings of Europe. While hardly consistent with the Napoleonic slides, this image may have appealed to a joyous anti-British or anti-monarchist sentiment among French audiences.

At any rate, these slides reveal a mismatch between the material and documentary evidence. The stories depicted are much more sophisticated than the bumbling paupers of most literary accounts. These are the only fully-confirmed itinerant's slides that survive, but others from the era present similar content. There are numerous grotesque caricatures and animal satires. Slides in the Media Museum show destitute figures, folk devils, and soldiers marching on the Scottish Jacobites (fig. 73). A four-slide sequence in the Museo Nazionale del Cinema (fig. 81) follows Napoleon's flight from Moscow, complete with miserable soldiers and a dead, frozen horse. The final slide shows his statue being toppled and a gleeful devil stealing his hat and crown. Bonaparte was everywhere. He continued to appear in lantern slides, popular prints, songs, and broadsides for decades after his final exile.

By presenting these stories as propaganda, Gonin makes them strange. He risks looking at lantern culture from the outside, making its early political stories into illegitimate government-sponsored outliers in an apolitical medium. But these were authentic expressions of a politically-charged moment. In the crucible of the revolution, the unfolding war, post-war depression, and political repression, it was natural that lanternists would take up these stories.

We might ask, in contrast, why later magic lantern discourses do not. Political figures presented among later retail lantern slides appear as profiles of great men.

There are numerous glowing illustrations of Wellington, Byron, Galileo, Da Vinci, John Milton, Walter Scott, and Nelson, alongside Napoleon himself, stripped of his army, angels, and devils, and now set happily in a timeless gallery of notable figures (fig. 82). Where are Gladstone, Disraeli, and Peel? Where are the Poor Laws, the Corn Laws, and the Chartists? Where are the voices of dissent among the later nineteenth-century lanternists?[60] The commodification of the lantern, and its integration into a respectable exhibition landscape, changed the stories that it told.

[60] Lantern stories may have been sanitised by the high-class slide retailers, or later political performances may have been ignored by lantern historians. In either, case there is a notable lack of radical voices from the hight of the lantern trade.



Figure 76.
Itinerant's Lantern, 1808-1820.

Found by Roger Gonin in a loft in Lanobre.



Figure 77.
La Lanterne magique, la piece curieuse, 1760-1800.

Engraving of an itinerant lanternist, by Poisson.
François Binétruy collection.

The lantern and slide match those found by Gonin.



Figure 78. Procession of animals towards the ark.
Itinerant's slide with moving eyes, 1807-1820. Roger Gonin 2016: 48.
Static panoramic slide, c.1820. Museo Nazionale del Cinema, Ref: M03022.
Static panoramic slide, c.1820. Cinémathèque Française.



Figure 79. The Egyptian Campaign of 1798.
Itinerant's slide with moving figures, 1808-1820. Roger Gonin 2016: 43.



Figure 80. La Liberté des Mers.
Itinerant's slide with moving figures, 1808-1820. Roger Gonin 2016: 58.

Figure 81. Bonaparte's Flight From Moscow.
Four-slide sequence, 1812-1830. Museo Nazionale del Cinema, Ref: M03009.











Figure 82. Portraits of Notable Men.

Wellington (unknown maker, NSMM 1990-5036/11735), Byron (unknown maker, NSMM 1990-5036/11721), Galileo (slipping slide by Carpenter & Westley, MNC M02704), Da Vinci (Carpenter & Westley, MNC M06704/002), Milton (Carpenter & Westley, MNC M03076/002), Walter Scott (unknown maker, NSMM 1990-5036/13980), Nelson (unknown maker, NSMM 1990-5036/13981), Napoleon (unknown maker, NSMM 1990-5036/11699)

VI. Radical Technologies

> I, with a few more lads under similar circumstances, was amusing myself in the Mall on Saturday evening; when one of those poor itinerant musicians began to grind out a tune on a barrel organ close beside us. […] When he had finished the tune, [he] addressed us, saying, that if we could among us muster him a few pence he would, in a house at no great distance, furnish us with a species of amusement which, he had no doubt, would please us much better than his music. […]
>
> [He] produced an article of which I had often heard, but had never seen, namely a magic lantern. After putting it in order, and extinguishing all the lights in the room, with the exception of that in his lantern, he proceeded to display before us some of the most curious scenes that any of us had ever witnessed, the description of which will convey to you a very tolerable idea of the present state of the country. (*Thaumaturgus* 1816: 3-4)

In the preface to this strange allegorical pamphlet, the publisher describes how he came upon a radical speaker in a public house near Dunblane. The speaker was reading a letter from 'a poor weaver in Manchester' named Donald Cameron. This letter, which captured the attention of all the men about, presented (as its subtitle states) 'at one view the distresses of the country, and some of the consequences of the late and just war'. The publisher resolved to print this, and three others.

Thaumaturgus; Or, the Wonders of the Magic Lantern presents the voice of a poor itinerant lanternist, who lucidly outlines the corruption and unease of the post-war years. He floats across the country, observing, performing, and raising the political consciousness of those around him. He uses his magic lantern as a machine to make the political world visible to the working classes.

> By a certain arrangement of glasses, whereon are painted, in a transparent manner, a variety of figures, he contrived to represent on the wall of the room those scenes which he described and explained to us, nearly in the following words:—
>
> Gentlemen, said he, it gives me exquisite pain to be obliged to present you with objects of such a melancholy nature as those which I am about to exhibit to your view; but at the present awful crisis, to disguise the truth is as pernicious as it would be impracticable. The circumstances

> which I am about to display to you are as familiar in real life as they shall be obvious to your sight; and my business this night is only to bring them more together, in order to condense a greater variety into less bounds than they can be found in reality. (1816: 4)

The lanternist presents a landscape view and an English farmer, once 'wallowing in luxury', but now facing poverty from price rises (1816: 6). He shows disbanded soldiers and the mechanics and their families—'clusters of poor ragged men, women, and children, standing shivering in the cold' (1816: 7). One imagines the lanternist throwing destitute figures upon a white sheet (fig. 73). He shows a group of wealthy gentlemen, 'the men who encouraged the infatuated Pitt to enter into the late war, and who stood behind him clapping him on the back, and hallooing him upon the unfortunate French nation as butchers do a dog at a bull-baiting' (1816: 11). These men chatter and debate over dinner. They petition against the income tax. 'There was not a word said about the war taxes, which grind the poor and middling classes. No, their whole energy was directed against the income tax, because by it they themselves were most affected' (1816: 12). The lanternist diagnoses a sick, corrupt society, where the upper classes care only for the welfare of their own pockets. The performance is still described as an 'amusement' by his observers, but he summons a discontented nation and profound underlying social anxieties. 'Hunger will break through stone walls' (1816: 7-8).

Even as commercial enterprise and middle-class affluence were growing, the country remained deeply troubled (Thompson 1968). People wanted political representation and reform and the magic lantern was one vehicle for this discourse. It was a machine that projected the world back onto itself. But the contours of this world were not self-evident. The political and social realities of the moment were fiercely contested, as shown by the conflicting views of republicanism and the wars; by prints, songs, and lantern slides alternatively ridiculing and lionising politicians and generals (Rossell 2008: 124; Gonin 2016: 64-65; Haywood 2011). Many prints and satires invoked the lantern as a symbol of this conflict.[61] A radical pamphlet claimed that William Pitt was in possession of a powerful lantern, capable of making plots and conquests visible:

> He gives and bequeaths to his old friend Mr. John Bull, his curious Magic Lanthorn, with which he has for many years past amused or alarmed his said honest, simple-minded friend, by shewing him

[61] Sources collected by Duller show that lanternists were viewed as satirical voices across Europe (2014a).

> conquests abroad, or plots at home; and he earnestly desires honest John will take particular care of it, least some future minister should get possession of it, and apply it to purposes as bad as his were always good. (Lee 1795: 21)

The reformist Thomas Hardy also had a lantern, revealed in a report on his trial for treason, but his slides were said to be more Jacobin than Pitt's conservative visions:

> He was asked if he had a magic lanthorn; he said, he had one—that it had nothing but the destruction of the Bastille and the beheading the Governor painted on it. (*The Trial of Thomas Hardy* 1795: 351)

The magic lantern was a symbol for radical voices because it was a worldmaking machine. Itinerant lanternists could speak about a society without being fully part of it. They were seen to flitter over the surface of countries and communities, able to diagnose social and political ills from outside. This is why a lanternist was chosen as the voice of radical reform in the *Thaumaturgus* text. He had the authority of an observer and, being poor himself, a natural kinship with the oppressed.

> The people throughout the whole country will raise their voice, and constitutionally demand a restoration to those rights which have been usurped by a vile faction, who have alternately, under the character of Whig and Tory, brought destruction on the land. (1816: 30-31)

The lanternist here becomes the voice of reform, calling for equal representation, the disenfranchisement of rotten boroughs, and universal suffrage. This was a world away from the slide sets advertised by retail instrument makers.

The early lantern was an information battleground. It was one of several key technologies of communication that helped structure the conditions of knowledge in the post-war era. Along with broadsides and popular song, it filtered into the lowest strata of society and spoke back to governmental and economic power (Jensen 2015). The new world could be a radically re-imagined world of overturned hierarchies, political representation, parliamentary reform, or revolution—or it could be an equally radical world of expanding capital, free-market liberalism, and global empire. This battle would rage across all media for a century.

Much media history has missed the variability of communication networks. Theorists like Jonathan Crary have made the effects of technology homogenous, by supposing transformations in perception and subjectivity as soon as new apparatuses appear. But the unrolling of new technological systems is uneven. Technologies appear, intersect with external paradigms, and often disappear. They are not used by everyone;

and even among their user base, they are not used in the same ways. The vibrancy of early cinema scholarship demonstrates this point. There were never uniform use patterns for any technology. Lantern scholars are yet to follow the social implications of different modes and strata of lantern practice.

Kittler argues that the magic lantern, in its very earliest days, was already a weapon in an image war between reformation and counter-reformation (2010 [1999]: 70-89). It was a transmitting apparatus for circulating different articulations of truth. The lantern tunnelled into the unfolding political debates of each era. It was a technology of image communication and worldmaking. The next hundred years were not only about the networks becoming mechanised by new technologies, as Kittler argued (1990 [1985], 1999 [1986]). They were not only about the multiplication of new manufacturing and retail networks, and the technological systems generated by these networks, as I have shown. They were about each social, discursive, technical, and political network grappling with all of the others. This was well shown by Thompson (1968) and Benjamin (1999 [1982]). Technologies alternately generate and suppress multiplicities.

VII. Pull Devil, Pull Baker

But still we have few original voices. The evidence provided shows that itinerant lanternists were highly politicised, often sophisticated, or vulgar, and that their worldmaking powers were much prized and feared. Yet still, there is almost no surviving evidence of lantern stories told from working-class perspectives (whether lanternist or poor observer). But looking to evidence provided by surviving printed broadsides we can find synchronous stories that crossed media.

Broadsides were cheap printed papers that had circulated widely since the earliest days of the printing press. They were used to spread news and polemics, circulate popular songs, and tell stories. They were hugely popular among the literate working classes and offer a valuable resource on working-class discourse throughout the early industrial period. Working-class industrial broadsides and printed songs reveal many of the social and political concerns seen in early lantern slides (Vicinus 1975). Again, Napoleon is everywhere (Jensen 2015). Broadsides present gallows confessions, comic stories, historic battles, grotesqueries, devils, strikes, and crooked capitalists.

They offer an exceedingly rich supplement to surviving slides. In most cases, they act as a discursive background to the slides, suggesting local preoccupations and interests that lanternists would surely have utilised. But in some instances, there are

close correlations between broadsides and slides. I have identified one popular lantern story, also told in catchpenny prints, that demonstrates the political content of even humorous lantern slides. I want to give an indication of the complexity and importance of a performance style so often dismissed as vulgar by documentary sources. The voices of our lost lanternists were beautiful and urgent expressions of a dying culture.

Pull Devil, Pull Baker (fig. 83) was one of the most popular lantern stories of its era. It appeared alongside the procession of animals in Joseph Leverge's Royal Galantee Show, and was widely cited as the archetypal Galantee tale. The story is of a baker caught fixing his scales and carried to hell as punishment. The baker and devil wrestle, pulling each other backwards and forwards, with the baker always losing. The tale could be told as a comic sketch, a moral parable about fraud, or, in the context of the late eighteenth century bread riots (Thompson 1968: 67-72; Gilmore 1992: 224-246), as a radical commentary on corruption and reform.

One broadside is titled 'Pull Devil, Pull Baker ! ! ! Or, The Baker's Act', published by J. Lewis Marks in 1822 (fig. 85; Bod 95.). This is not a direct representation of the story, which was fairly old by this point, but a song framing the 1822 Bread Act in the context of the baker's famous tussle with the devil:

> Ye Bakers of London, beware,
> Who have long liv'd on adulteration;
> Your Scales and your Weights now prepare,
> And tremble at the Alteration.
> The D—l has ta'en it in head,
> And swears, sure as he's a black sinner,
> If ye do not all *bake* better Bread,
> He'll *roast* ye, and eat ye for dinner.
> Rumpti iddity.

This made a popular song of a government attempt to standardise the weight of bread, to prevent loaf sizes from fluctuating according to the price of corn or wheat. The Bread Laws, as Kirkland summarises, were 'designed to protect the public against the possible and probable dishonesty of bakers and breadsellers' (1895: 413). The bakers were hated. They were thought to sell loaves filled with rocks and to use various underhand practices to fix their scales, or exploit varying food prices in their favour. It is hard to understand the anger towards them today, but bakers held power over what was, for many people, their staple foodstuff. The hellfire of the language in this broadside is a reflection of the political importance of access to bread.

The lanternist of the *Thaumaturgus* pamphlet also has things to say about the bakers. Conjuring up a cityscape, he tells a story of corruption among bakers and officials.

> In the city in question the most shameful and barefaced direliction of that important duty prevails. The weights and measures are most egregiously deficient; and the bread, the weight of which is regulated by law, is now suffered to lie at the mere discretion of the avaricious or the fraudulent baker. The large loaf is known to be grossly deficient in weight, and the small one, by which the poor suffer most, is made to suit the insatiable desire of the huxter. (1816: 34)

And so the suffering poor told raucous stories of panicked bakers wrestling with the devil, or stuffed in a wicker backpack, praying as he is carried to a raging hellmouth (fig. 83). One can imagine the cheers and laughter this scene must have provoked. It offered an imagined justice for those who had suffered from weighted scales.

The story was so popular that it once appeared as the rhyming solution to an enigma in *The Wit's Magazine*:

> And join with me, in chearful lays,
> To chant the MAGIC LANTHORN's praise.
> See, O see! against the wall,
> 'Now, Devil, pull! now, Baker, haul!'
> Alas! the devil gains the day; See the baker borne away!
> In hell the cheating baker lays;
> Then chant the MAGIC LANTHORN's praise. (1784: 278)

Between this puzzle and the later broadside, the story had remained a touchstone in the public consciousness for thirty-eight years, becoming, at different moments, a useful framework for conceptualising fraud, price rises, bread riots, food shortages, and political legislation. The story was more than a moralistic lantern tale—it was a lightning bolt for every kind of inequality, corruption, or hubris. A slide in Binétruy's collection (fig. 84) transfers the visual grammar onto Napoleon, showing that he too was in league with the devil (this time, a red-coated soldier puts a sword through both of them).

A second broadside inserts the story into the popular 'derry down' refrain of eighteenth century song. This song is called 'A new and curious DIALOGUE BETWEEN THE Devil and a Baker' (Bod 16108; fig 86). It features an evil baker in alternating dialogue with the devil.

T'OTHER evening a baker fat hatching of evil,
He turn'd his head round and there stood Mr. Devil,
O ho! quoth the baker, being in a sad fright,
What brings your infernalship here on this night?
Derry down, down, down derry down.

DEVIL

I'm come, Mr. Baker, pray be not afraid,
To praise much you conduct in raising the bread,
For by griping, and pinching, and starving the poor,
A warm place in my regions you thus will secure.

The writer had found a to-and-fro song structure to project the popular lantern tale into a new format, the devil detailing all of the amusing and deserved ways that the wicked baker will be punished ('bak'd like a hot roll, burnt up like a pye crust') and the baker pleading excuses. This is not a subtle song, but it is a useful vehicle for all of the vicarious pleasures of punishing the powerful. For good measure, it also confirms a number of other hated professions, soon to meet similar fates:

Farmers, millers, and mealmen no better than me,
When I come to your regions shall I there them see?

DEVIL

Why yes, Mr. Baker, they're down in my list,
But I now must be jogging, so give me your fist.

These songs cannot reveal the words of lanternists, but they provide essential contextual colour to the Pull Devil, Pull Baker slides. Lanternists would have projected this story to similar audiences and it would have prompted similar responses. Judging from this broadside, the lanternist's tone would have been darkly humorous, angry at perceived injustice, cognisant of unchanging corruptions, but delighting in stories of devilry and hellfire that overturn long-persisting power relations.

The story was not simple grotesquery or droll humour, as many critics presume —it was apocalyptically political. It articulated an enormous body of obscure grievances, hatreds, and injustices. It gave voice to political discourses that could perhaps not otherwise have been expressed. It was a macabre safety valve for working-class resentment. Other writers used the story as an empty metaphor for back-and-forth struggles (Lyon 1813: 9; Coleridge 1989 [1816]: 36; *Monthly Mirror* 1802:

220; 'The Otter Hunt' 1835: 142). Later, the showman Albert Smith mourned the loss of the story as a kindly old friend:

> The magic-lantern will be cast aside for the gas-microscope; and our friends, the devil and the baker, the tiger that rolls his eyes, and the birds that fly out of the pie, will at last vanish away to nothing in reality. (1852: 106).

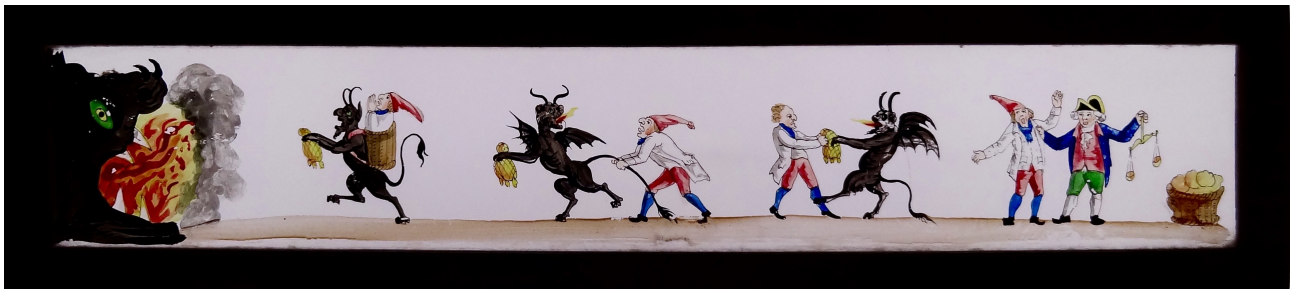
This does a disservice to the political import of the early lantern stories. It was typical of the higher classes to misdiagnose political content and their expressive frameworks. One critic complained of the 'unmeaning impertinence' in popular entertainments. He said: 'a chorus of derry down is merely an apology for noise and riot' (Plumptre 1805: 12). But this was exactly the point. Songs, lanterns, devils, bakers, and all were performative symbols of food shortages and bread riots. Other broadsides make this clearer still. From 'The Baker's Glory, OR THE CONFLAGRATION' (Bod 16637):

> The price of bread, so dear you see,
> Let's hope it will much cheaper be.

From 'The RIOT; Or, HALF a LOAF is better than no BREAD' (Bod 24386):

> Come, my neighbours, no longer be patient and quiet
> Come let us go kick up a bit of a riot;
> I am hungry, my lads, but I've little to eat,
> So we'll pull down the mills and seize all the meat;
> I'll give you good sport, boys, as ever you saw,
> So a fig for the justice, a fig for the law.
> Derry down.

Figure 83. Seven variations on Pull Devil, Pull Baker



Pull Devil, Pull Baker, slide by Robert Bancks. 1795-1831.
National Science and Media Museum, Ref: 1951-310 Pt2.



Pull Devil, Pull Baker, slide by an unknown maker. 1800-1840. Phillip Roberts collection.



Pull Devil, Pull Baker, slide by an unknown maker. 1800-1840.
San Diego State University Library.



Pull Devil, Pull Baker, slide by an unknown maker. 1800-1840. Bernd Scholze collection.



Pull Devil, Pull Baker, slide by an unknown maker. 1800-1840. Mervyn Heard collection.



Diablerie slide by an unknown maker. 1800-1840. San Diego State University Library.

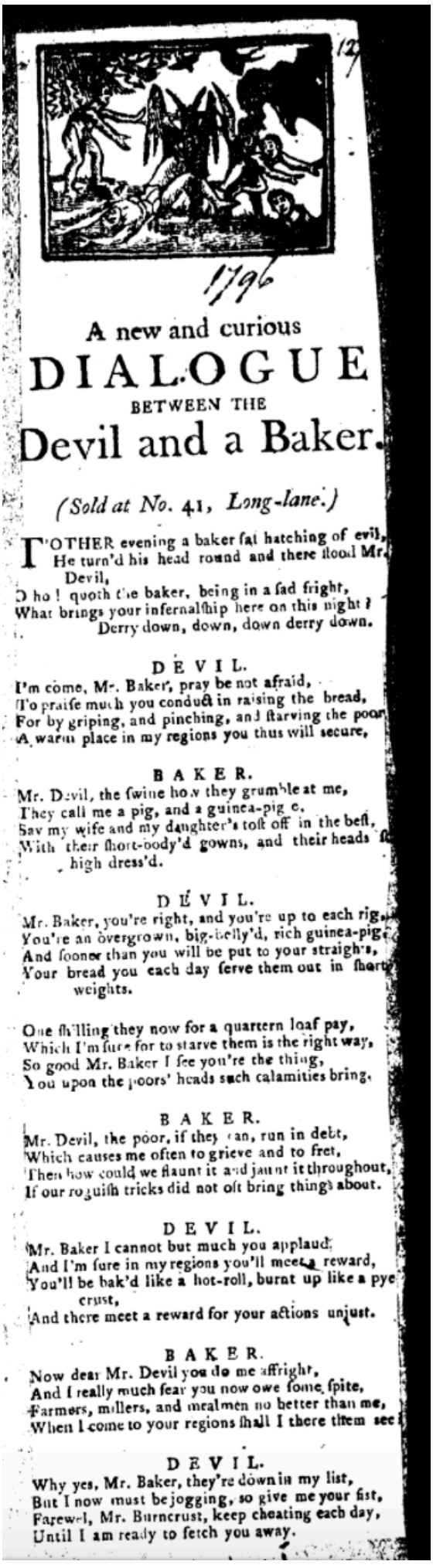


Diablerie slide by an unknown maker. 1800-1840. San Diego State University Library.



Figure 84.
Detail from a British slide showing Napoleon embracing the devil, unknown maker. 1800-1840.
Françios Binétruy Collection.

This slides reuses the visual style of the common Pull Devil, Pull Baker slides to tell a different story about Napoleon's friendship with the devil.



1796

A new and curious

DIALOGUE

BETWEEN THE

Devil and a Baker.

(Sold at No. 41, Long-lane.)

'TOTHER evening a baker ſat hatching of evil,
He turn'd his head round and there ſtood Mr.
Devil,
O ho! quoth the baker, being in a ſad fright,
What brings your infernalſhip here on this night?
Derry down, down, down derry down.

DEVIL.

I'm come, Mr. Baker, pray be not afraid,
To praiſe much you conduct in raiſing the bread,
For by griping, and pinching, and ſtarving the poor,
A warm place in my regions you thus will ſecure,

BAKER.

Mr. Devil, the ſwine how they grumble at me,
They call me a pig, and a guinea-pig e.
Sav my wife and my daughter's toſt off in the beſt,
With their ſhort-body'd gowns, and their heads ſ
high dreſs'd.

DEVIL.

Mr. Baker, you're right, and you're up to each rig,
You're an overgrown, big-belly'd, rich guinea-pig,
And ſooner than you will be put to your straights,
Your bread you each day ſerve them out in ſhort
weights.

One ſhilling they now for a quartern loaf pay,
Which I'm ſure for to ſtarve them is the right way,
So good Mr. Baker I ſee you're the thing,
You upon the poors' heads ſuch calamities bring.

BAKER.

Mr. Devil, the poor, if they can, run in debt,
Which cauſes me often to grieve and to fret,
Then how could we flaunt it and jaunt it throughout,
If our roguiſh tricks did not oft bring things about.

DEVIL.

Mr. Baker I cannot but much you applaud,
And I'm ſure in my regions you'll meet a reward,
You'll be bak'd like a hot-roll, burnt up like a pye
crust,
And there meet a reward for your actions unjuſt.

BAKER.

Now dear Mr. Devil you do me affright,
And I really much fear you now owe ſome ſpite,
Farmers, millers, and mealmen no better than me,
When I come to your regions ſhall I there them ſee

DEVIL.

Why yes, Mr. Baker, they're down in my liſt,
But I now muſt be jogging, ſo give me your fiſt,
Farewel, Mr. Burncruſt, keep cheating each day,
Until I am ready to fetch you away.

Figure 86.
A New and Curious Dialogue Between the Devil and a Baker.
Published by John Evans. 1796.
Bodleian Library, Ref: Bod16108.



Pull Devil, Pull Baker ! ! !

OR,

THE BAKER'S ACT.

Sung with unbounded Applause throughout the Metropolis.

YE Bakers of London, beware,
Who have long liv'd on adulteration;
Your Scales and your Weights now prepare,
And tremble at the New Alteration.
The D——l has ta'en it in head,
And swears, sure as he's a black sinner,
If ye do not all *bake* better Bread,
He'll *roast* ye, and eat ye for dinner.
Rumpti iddity.

2.

Full weight too, he swears he will have,
As sure as the Devil's in London,
So Bakers mind how you behave,
Or you will all quickly be undone.
I'll tell you what I think it's thro',
You may call it if you please a frolic,
Your *Potatoes* have been so damn'd new,
They've given all Hell the wind-cholic.
Rumpti iddity.

3.

Ramoe Samee has bolted a stone,
As big as the egg of a Hen, sir;
But a Half-quartern Loaf you must own,
Is by far much bigger than ten, sir!
Our Ministers too have found out,
The Bakers their efforts can't baffle,
That stone-eating, without the least doubt,
Is apt to give people the gravel.
Rumpti iddity.

4.

They've resolv'd that the Bread shall be made
Of Wheat, Rye, Rice, Oats, or Barley;
That ev'ry bit shall be weigh'd,
And no Baker shall stand for to parley.
But if he refuses to weigh,
At any customer's direction,
Forty Shillings he quickly must pay,
Or Three Months in the House of Correction.
Rumpti iddity.

5.

Now ye Journeymen Bakers who live
On the plundering of poor people's dishes,
Be content with what your masters give,
Or things won't go quite to your wishes.
You'd fain have a finger I know,
In ev'ry man's pie but your own, sir,
For which to hell you will go,
So you'd much better let it alone, sir.
Rumpti iddity.

6.

Then may Masters and Journeyman who
Won't comply with these new Regulations,
Be doom'd to starve upon Gru-
el; and the Public Donations.
May the D——l make them a rich stew
Of dripping, horse beans, and Scotch pebbles;

Figure 85.
Pull Devil, Pull Baker ! ! !
Or, The Baker's Act.
Published by J. Lewis Marks. 1822.
Bodleian Library, Ref: Bod95.

Conclusion.

The Emergence and Decline of the Magic Lantern

I.

By midcentury the lantern trade was big business. The itinerants were almost all gone, victims of economic transformation, sedentary retail, and new entertainment habits. The Kaleidoscope had suggested new strategies for media instruments and a wave of optical and printed novelties emerged after it. The barrage of Myrioramas, Polyramas, Thaumatropes, Kaleidophones, Phenakistiscopes, Anorthoscopes, and Stereoscopes; later the Zoetropes, Kineographs, Praxinoscopes, moving-picture machines, and View-Masters, changed purchasing habits and transformed people's relationship with wonderment. The magic lantern still revealed a new world of miraculous visions, but they were now of a different order. The vicious political satires and grotesqueries were shunted to the cultural periphery by mechanical trickery and perceptual curiosity (and their bedfellows: scientific education, topographic narratives, wordplay, comic fluffery).

Mary Carpenter, now in control of Carpenter & Westley, shed her Birmingham business to Robert Field (*Aris's Birmingham Gazette*, 19 Aug 1836), accrued the respectability of a London professional, and made a fortune from the new markets. Carpenter & Westley remained optical instrument makers, putting out huge quantities of spectacles and other commercial optics. Their lantern business was spectacular, driven by the highest quality of slide painting and new types of lantern. They supplemented their Phantasmagoria Lanterns with mechanical dissolving systems and improved lighting technology. They were among the most aggressive exploiters of the new trend for dissolving views in the 1840s and 1850s, producing complex transformation effects and marketing their slides and equipment to the growing population of professional lanternists. The lantern was absorbed into the expanding theatrical and lecturing circuits. In 1865 Carpenter & Westley were giving lantern shows at Windsor Castle (ScM 1948-397/12).

Other lantern retailers sprung from the earth. William and Frederick Newton, the famous globe makers, shifted into lantern production around 1850. They released a grander, mahogany-bodied professional lantern and increased slide production to levels that were previously unsupportable. Other instrument makers like John Wrench, W.C. Hughes, and E.G. Wood followed suit, coming to specialise in lantern production, while others—James Bamforth, Riley Bros., W. Butcher & Sons, J. Barnard & Sons, Archer & Sons, York & Son—entered the market with no previous connection to the instrument trade. Frederick York started as a publisher of photographs; Jabez Barnard was an artists' colourman (as Scott had been in an earlier age); William Frederick Archer made musical instruments; Butcher was a chemist. These new manufacturers enjoyed a hugely expanded lantern trade. They exploited new innovations to reimagine the lantern in its various retail and exhibition contexts.

Limelight, an incandescent lighting technology, was applied to the lantern by 1838, enabling exhibitors to project in front of hundreds of spectators, integrating the medium into the multiplying lecture halls and exhibition circuits. The dissolving views developed a new visual grammar, using multiple lanterns to superimpose images in delicate fades and complex sequences of effects. Newly-armed professional lanternists made the medium slick and subtle. Some of the larger exhibition venues used these new tools to present mixed-media lantern shows of outrageous complexity.

A newly-invented commercial photography piggy-backed on the retail networks of the lantern trade and intersected fully in the 1860s with the perfection of photographic slides. This was quickly followed by lithographic, and chromolithographic, transfer slides. These processes finally enabled automatic slide reproduction, resulting in an exponential increase in slide production. The Newtons' catalogues listed thousands of slide sets.

Photography produced a new sphere of (initially, wealthy) amateur photographers capable of producing their own photographic slides. Bamforth and York applied photography to a new form of lantern image called the 'life model' slide. These were posed photographic scenes, hand-tinted by armies of slide colourists, that told moralistic or sensational stories across many slides. The most popular slides of the later-lantern era—social dramas, landscape views, temperance tales—were well-suited to photographic reproduction. Barnard utilised the brilliant colour palate of the chromolithographic process to sell a different lantern world of adventure stories, animal tales, and cheerful monarchs.

By the end of the century little chromolithographic slides were packaged with cheap tin lanterns from France and Germany. These new lantern sets miniaturised the

earlier commercial packages of Carpenter and his contemporaries. They flooded the market. Butcher & Sons established the Primus brand to distinguish their 'juvenile lanterns'. Gebrüder Bing, Ernst Planck, and Lapierre et Cie dominated this emerging market in the early years of the twentieth century. The engineers and lantern exhibitors had, by now, dreamt up a new world of moving photographic pictures.

Many lantern worlds opened over these decades. The later nineteenth century is the era of the most sustained scholarship on the magic lantern and its various applications and contexts. There is no single authoritative text, but a huge amount of scholarship and data has been produced. This is all the better considering the tremendous diversity of lantern practice. The literature unrolls the many worlds of the late nineteenth century lantern. It shows how the prestigious exhibition halls and public institutions used it to instruct and entertain; how religious groups exhibited lantern shows to promote abstinence among the poor; how it lived alongside the early cinema; how entrepreneurs imagined uses for the lantern as street advertisement, projecting on buildings, as Blunt had earlier dreamt, or on a screen atop a hawker's shoulders.

The causes and implications of these many diverse uses are rooted in the varied economic and cultural conditions of the era. There are works of great critical depth that explore the wider lantern worlds of the later nineteenth century, but the greatest portion of the literature is concerned with micro-histories, narrative content, and technical detail. For many scholars, themselves projecting the lantern as precursor to later visual media, it is unimportant where the precursor itself came from. The most common solution is to catapult the machine further backwards into the seventeenth century to live among shadows of the natural philosophers and polymaths. The lantern was invented in another world, conveniently distant from its mass-media zenith in the 1880s.

But as Kittler and Zielinski have shown, the media systems of this world are so different that this lantern bears no relation to its later iterations. The magic lantern has been hammered into so many different shapes that we must look to more recent transformations to understand why the lantern trade and its exhibition networks emerged. There are many transformations to choose from: limelight made it an instrument for public entertainment; lithography made it a medium for the circulation of mass-produced artworks; photography one for reproducible views of life; dissolving views gave it a new artistic language; the rackwork slide, Choreutoscope, Wheel of Life, and Kineoptoscope gave it a plethora of new tricks. There are numerous studies and fragments that reveal each of these innovations. But a tunnel of inventors does not resolve our problem. There was never only one lantern world. Every innovation

openned a new creative space that was differently exploited. It was in the connecting fibres that we should have lived. It was the things that joined our worlds—economies, production infrastructures, distribution networks, spoken and written words issued from every quarter. These fragments can better explain why the lantern metamorphosed as it did.

Few media scholars expend significant efforts on the early nineteenth century. The standard map of lantern history leaps over these years, moving from Robertson's Phantasmagoria, setting one foot down on Philip Carpenter's transfer sliders, and on to the Polytechnic Institution and the fully-constituted lantern trade. Wider media scholarship might also mention the Thaumatropes and Phenakistiscopes, but it is rare for these moments to be joined together, or for conclusions to invoke a quieter connecting history of retail. My research demonstrates how all these instruments were embedded in a moment of expanding commercial possibilities. There were many different histories of mathematical instrument makers, itinerant entertainers, retailers, opticians, public scientists, brassfounders, tinsmiths, publishers, and painters. A series of lightning-bolt moments drew together and scrambled all of these diverse historical trajectories. The result was a string of newly-imagined media instruments and a newly-realised commercial potential. These things were demonstrably profitable and this fact alone was sufficient to produce a sprawling network of practitioners. The lantern trade was born at about 1840 from the actualisation of a sleeping potential that emerged over the previous few decades. Carpenter was now dead.

II.

The public perception of the lantern changed over the first few decades of the nineteenth century. The instrument was welcomed into respectable society as a result of Carpenter and others' reinterpretation of the lantern as a consumer object. The instrument's general visibility increased. More manufacturers followed suit and it became a device for domestic consumption. Professional lanternists became more prominent and would soon be regarded as educators and high-class showpeople.

The Galantee Men had tended to rely on the striking spectacle of lantern projection. In a world where the rich had lanterns at home, this was no longer so easy. The domestic Phantasmagoria Lantern presented a significant challenge to the survival of the poor lantern pedlars. This is confirmed by the *Penny* Magazine, which invokes the multiplication of domestic lanterns as an explanation for the disappearance of the itinerants:

> Many of our young people have now better magic lanterns of their own within doors; and this fact may have driven away the old exhibitors by making their trade unprofitable. (‘Magic Lantern at Rome’ 1845: 101)

But as we have seen, there were more profound economic shifts making the business of peddling untenable.

There was no direct equivalence between the Galantee performances and their domestic counterparts, but the moment generated an ongoing tension between a reputable articulation of the lantern and its older life as the tool of itinerants and charlatans. The eventual development of a lantern trade, and the ensuing specialisation of media practitioners later in the century, was built on a shift towards respectability and general middle-class consumption. The consumer revolution triggered by the Phantasmagoria Lantern drowned the struggling Savoyards. ‘The galantee show don’t answer, because magic lanterns are so cheap in the shops’ (Mayhew 1851 [Vol. 3]: 73-74). ‘The toy sellers, by selling magic lanterns cheaply, have destroyed this industry of the streets’ (Dillaye 1885: 359; Mannoni 2000 [1995]: 103).

Another Mayhew interview was printed in the *Morning Post* in 1850; this time with a manufacturer of lanterns and fancy toys. This man, of a ‘better class of prosperous artisans’ (1973 [1850]: 356), had profited from the changing economic landscape. He recounts the slow evolution of the lantern over his career:

> I have known the business of magic lantern making thirty-five years. It was then no better than the common galantee shows in the streets. Punch and Judy, or any peepshow or common thing. There was no science and no art about it. It went on so for some time—just grotesque things for children, as “Pull Devil and Pull Baker”. (1973 [1850]: 356)

He shows Mayhew a slide ‘in the old style’ (1973 [1850]: 356), illustrating a cat washing clothes in a bathtub, before going over the introduction of various subjects that he takes as important steps in the modernisation of the lantern—Robin Hoods, Robinson Crusoes and Bluebeards (‘uncommon blue their beards were, to be sure’, 1973 [1850]: 357); diagrams for astronomy, eclipses, comets, signs of the zodiac, and moving diagrams. ‘These things’, he says, ‘greatly advanced the art and the demand for magic lanterns increased’ (1973 [1850]: 357). It is instructive that this man speaks much of art, yet concludes with a discussion of prices, sales, and the growing ‘magic lantern business’ (1973 [1850]: 359). Ultimately, the lantern’s transformation occurred because there was money to be made in its exploitation.

The everyday practice of lantern manufacture, retail, and exhibition took place in anonymous workshops, retail shops, entertainment venues, and homes. Lantern practice almost always left no trace. These few scattered, ephemeral fragments serve only as poles around which to orient a larger structural history of the medium.

The lantern as a producer of fleeting visions was a common symbol in contemporary discourse, with many writers taking up the instrument as a useful literary trope to reflect the evanescence of a moment. An unnamed writer for *The Evangelical Magazine* used the lantern as metaphor in their reflections on time and eternity:

> In Time I see the abode of Ephemeræ, the passing creatures of a moment. There all things are born but to die; appear only to vanish. Brass corrodes, marble crumbles, and the whole scene passes as the figures of a magic lantern. ('The Meditation of an Interesting Moment' 1806: 27)

The lantern offers a material correlative to the entropic passage of time because of the impermanence of its projected images. Over the longest timescale, history leaves no traces at all; but lantern practice is ephemeral even in the present. The machines and objects may remain, but records of their everyday use were absent in their own era—already corroded and lost at the moment of projection.

We can use the surviving evidence to build a tapestry of illustrative fragments that indicate recurring practices and trajectories. It is barely ever possible to build a complete history of individual lantern practitioners and even highly visible cases resist generalisation. But the numerous objects and texts and many minor stories can be used to suggest an indicative framework for the expanding lantern trade. I offer a structural history that can be used to thread together numerous singular voices that emerge from their historical records. Over the few decades after 1810, this wreckage of material and discursive fragments shows how and why the lantern trade (and a broader entertainment media trade) began to emerge.

The old shopkeeper continues: 'But I should tell you that Dollond, before that, made improvements in the magic lantern; they called the new instrument the phantasmagoria' (Mayhew 1973 [1850]: 357).

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