

NÜRNBERG AND THE BULL'S-EYE MAGIC LANTERN

by Deac Rossell

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In the past few years, I have traced eight surviving 'Bull's-Eye' lanterns dated by their owners to about 1800 or before, lanterns now held in collections in five different countries. For the purpose of description in this article I have numbered them 1 through 8, as described below. I should say at the outset that I have not had the chance to examine all of the lanterns themselves, and therefore sometimes rely on their descriptions in catalogues and other reference sources.

The existence of these lanterns poses a special problem for the lantern historian. With one exception, no other pre-1800 (or circa. 1800) lantern design survives in anything other than a unique example.¹ These eight lanterns also represent roughly one-third of all the seventeenth- and eighteenth-century magic lanterns known to survive: I know of only 27 instruments clearly from before 1800. They also show remarkable similarities in overall design, construction, size, and detail. Lantern No. 2 bears the nameplate of a retailer, but otherwise they are anonymous, unmarked products. And although there are modest echoes for this design in the contemporary literature, this style of lantern is not illustrated in any of the works that are known to have influenced (or reflected) the construction and dissemination of the lantern, such as the engravings found in books by Johannes Zahn, Willem Jacob Storm van 'sGravesande, Christian Hertel, or others.²

What then, was the origin of these lanterns? Why do they seem to survive so (relatively) widely? If the design was popular enough for multiple examples to survive, spread across several European countries, why is the design not illustrated widely in the optical literature? Why are these lanterns so anonymous? How is it that, despite remarkable similarities in overall construction, they show detail distinctions that indicate a number of different makers? How did the design circulate between these various makers? Although these six lanterns were clearly not made by the same workshop, they are also too similar in design to have been produced without a substantial design/construction context shared by their makers. What could account for these eight lanterns?

It is my contention that the most likely explanation for these questions is that the Bull's-Eye lanterns were the product of the eighteenth-century metal handcraft industry in Nürnberg (Nuremberg). At the moment there is only indirect evidence to back up my instinct, but the exploration of some possible alternatives always seems to lead back towards Nürnberg as the source of the Bull's-Eye lantern.

The Lanterns

Although this type of lantern has been recognised for many years by the magic lantern community under the term 'Bull's-Eye lantern',³ neither the remarkable similarity of the existing lanterns nor their subtle differences have been adequately examined. I will begin with some similarities.

The lanterns are strong, solidly constructed, and made of tin. One has been weighed at over 2kg. Three measure 41cm high (Nos. 1, 2, 4) and of those with existing chimneys, none varies more than 3cm from this dimension. The main body of the lantern is always cuboid; two lanterns (Nos. 2, 5) measure 17.5cm square, with two more at 17cm (Nos. 1, 7), and one is slightly larger at 24cm whilst showing the same proportions and design as its smaller cousins. At least four lanterns have the same handle of flat tin with a hand-support insert (Nos. 1, 4, 6, 8); it seems likely that this handle is also present if unseen on others. All of the lantern bodies are set on a small pediment with a sloping front. All have a lens tube of proportionately large diameter, and five (Nos. 1, 2, 3, 4, 7) have two sliding sections to this tube; again it is likely that others have two sliding sections, although it is certain that No. 8 has three. The overall design, construction, proportion, material, and impression of the six lanterns suggest that they represent a type, and that they should be considered together. Yet at the same time, it is clear that they have come from several different makers.

Some differences are subtle: No. 6, for example, a lantern with all components well within the norm for a Bull's-Eye design, seems quite modern and regal, since its lamphouse is proportionately taller for the dimensions of its body. Although there are limits on interpretation through photographs and published images, it is clear from a glance at Nos. 1 and 5 that the number of vertical columns in the chimneys varies between lanterns. Two lanterns nearly identical in size and shape (Nos. 1 and 2), for which lens measurements exist, carry quite different optical systems: No. 1 has lenses of 11cm and 5 cm diameter, close to No. 7 at 10cm and 4cm, while No. 2 has lenses of 9cm and 3 cm. No 8 has a condenser of 7cm diameter and a front lens of 3,5cm. Nonetheless, the slide stages for all measured lanterns are very similar at 12.5cm (No. 1) and 13cm (Nos. 2, 7), although No. 8 is a bit smaller at approximately 9cm. Doors in the lantern bodies seem to fall into just two

categories, one a larger door occupying virtually all of the right-hand side, the other a smaller door set into the side so that a substantial amount of tin remains as its frame. Colour is also present and differs from lantern to lantern; they are variously painted very dark green (No. 4), brown (No. 1), matt black (No. 6), dark blue-black (No. 2), or plain black (No. 5).

Four lanterns have 'distinctive' differences: detail elements which do not affect the overall impression of the lantern but which give each specific example an individual touch. In some ways these are the most interesting elements of the lanterns, and certainly they are the most visibly human, handcrafted aspects of the lanterns, though remaining wholly anonymous. No. 4 has four small flame shapes cut out at the top of its chimney. No. 6 has an elegant door catch in the shape of a small leaf with hammered parallel veins. No. 8 has four small spherical ball feet supporting the sloped pediment of its lamphouse. No. 1 has an interrupted front sloping pediment: it is particularly interesting to see such a distinctive difference, since apart from its lens diameters, No. 1 is otherwise almost identical to No. 2. Equally, the chimney flames of No. 4 are the only non-conforming element that distinguishes this lantern from Nos. 1, 2, 3, or 5. Two lanterns, Nos. 7 and 8, have the double-bent chimneys which are today commonly considered chimneys for phantasmagoria lanterns, because their bends ensure that no stray light is emitted from the lamphouse, a necessary provision when a lantern is mounted or carried behind a rear-projection screen for phantasmagoria effects. However, in practice in the early 19th century, catalogues show double-bent chimneys on lanterns intended for Argand lamp illumination, and simple crinkle-top chimneys for lanterns intended to be used with oil or candle illumination. Nonetheless, No. 8 seems intended for candle illumination, as it has survived with an original adjustable fitting for candles.

It is probably worthwhile to state a preliminary conclusion from this physical description of the eight lanterns: shared design characteristics and dimensions indicate that they were probably made within the same general system of manufacture, but by different craftsmen or separate metal/optical workshops who then added distinctive elements that would not alter the overall design, its cost or its speed of manufacture. The design is efficient and practical: there are no flourishes indicating anything other than the most economical use of materials, and there are neither showy materials (brass, rare woods) nor elaborate fittings (in latches, hinges, or lens retainers).

Lantern No. 2 has a nameplate attached: "Scott. No. 417 Strand London." This is the plate of John Scott (1752-1838), the artist's colourman and impresario whose business was established enough to allow him to build the Sans Pareil Theatre (later the Adelphi) in 1806

for his daughter, a singer. Scott's shop sold hand-painted lantern slides, and as an established colourman, he was in close contact with painters with the necessary skills to work on glass., Numerous slides marked "Scott, Maker No. 417 Strand, London" survive, mostly from around 1820. But there is no evidence that Scott was an instrument maker or optician. It is unlikely that he was actually making magic lanterns, and he does not appear in Gloria Clifton's *Directory of British Scientific Instrument Makers*.⁴ The nameplate on No. 2 is probably a retailer's plate rather than a maker's plate. This suggestion is given added substance because Scott advertised, from 7 January 1791 until 12 May 1801, that he had "imported large quantities of lanterns from Germany; they are contained in neat boxes, each lantern with 12 slides . . . half a guinea to two guineas each also some larger at 12 guineas each."⁵ These lanterns could well have been ordered from Nürnberg, and Scott's advertisements cover a good portion of the period to which my Nos. 1-8 are currently dated and in which No. 2 was probably originally sold.

Nürnberg Tand

Nürnberg magic lantern production, in recent accounts, is almost wholly identified with lightweight toy lanterns in a wide variety of designs, partly because so much work has been done in general on the manufacture of tin toys in Nürnberg, and partly because these lanterns are still so widely available on the collectors' market. But I do not think that the Bull's-Eye lantern was sold as a toy, and it will be worthwhile briefly to sketch the background of the Nürnberg metalworkers and the production of Nürnberg goods, often known as *Nürnberg Tand* or *Galanteriewaaren*. At the time, although often forgotten in the Twentieth Century, it was perfectly clear that the term *Nürnberg Tand* referred not just to items actually produced in the city of Nürnberg itself, but also to those goods produced in dozens of surrounding towns and villages, significant amongst them Fürth for optical goods, Oberammergau for wooden carvings, and Regensburg. Nürnberg became the headline city for all of these goods because it was the town that provided the international gateway for products from across the region, the city which the wholesale agents called home and where the established national and international markets were held.

The seventeenth- and eighteenth-century metal workshops of Nürnberg produced an amazing variety of goods, only a small proportion of which were toys. Although Nürnberg is famous for toy production from the fourteenth century onwards (especially dolls and wooden toys, and stamped metal toys from early in the nineteenth century), most of the small handcraft shops and metalworkers in this important industrial city with a highly skilled workforce produced something that is better characterised in one of two ways: either

household necessities made as inexpensive alternatives to finely-crafted goods (such as table-settings, lamps and jewellery) or household gadgets that added lustre to a middle-class household's basic furnishings (for example apple parers, inexpensive globes, or puppet theatres). It is important to keep in mind that Nürnberg made useful and/or entertaining goods for adults as well as toys for children. The famous tin toy empire of the Bing brothers also made solid portable typewriters for home and office use, just as the toy lantern firm of Johann Falk made sciopticon lanterns for churches and schools, and semi-professional cinematographs.

With specific regard to the magic lantern, it is clear that the design Johann Franz Griendel manufactured in Nuremberg in the seventeenth century could not be called a 'toy lantern' in today's sense: it was offered in a list of optical instruments Griendel sent to the eminent mathematician and scientist Gottfried Wilhelm Leibniz in December 1671.⁶ Much later, when the showman Wilhelm Bahr reviewed professional lanterns for showmen in 1875, he recommended the today unknown Nürnberg lantern makers Daenecke and P.C. Kalb as able to supply "properly useful dissolving view apparatus" as well as lanterns from well-known firms like Krüß in Hamburg and Ed. Liesegang in Düsseldorf.⁷ The central problem of our view of the Nürnberg magic lantern today is that, while the history of children's lanterns has now been traced back to around 1780, with many surviving lanterns identified from around 1830 onwards, the history of the 'adult' lantern in Nürnberg remains effectively a blank page in history after about 1677, when Griendel left the city.

It is one of the holes in the history of 'proper' lantern construction in Nürnberg that I am trying to fill with this thesis about the manufacture of the Bull's-Eye lantern. For while little is known about just what kinds of lanterns were being made in Nürnberg for two centuries after the 1670s, it seems clear that there was an ongoing production throughout this period. In 1698 Christoff Weigel stated that *Flaschner* (tinsmiths) made "optical art- and picture-lanterns" as well as speaking tubes and land telescopes (spyglasses).⁸ The Augsburg optician Berkenstein was commissioning slides for his own lanterns from Nürnberg painters in the 1740s.⁹ In his 1967 doctoral thesis on the Nürnberg toy industry Georg Wenzel contended that in the 1750s "the peepshow, camera obscura and magic lantern were in fashion . . . made either from sheet metal or from wood, and put together by either cabinetmakers or lacquerers."¹⁰ When Peter Friedrich Catel opened his "Nürnberger Laden" in Berlin in 1780 his goods probably included the magic lantern; certainly it appears in his 1785 catalogue and was illustrated in his 1790 catalogue.¹¹ Most of Catel's lantern stock probably consisted of 'toy' lanterns, as were those imported at around the same time by John Scott in London, but the offer of a variety of sizes by Catel, and the mention in Scott's

advertisements of lanterns much more expensive than the toys he was offering at half a guinea to two guineas each, indicates the availability of a more substantial product as well.

In 1798 Jacobi's *Lexicon* commented that Nürnberg was a centre for the mass production of magic lanterns, which were traded extensively around the world, particularly with England.¹² And, this time referring specifically to toy lanterns rather than 'adult' lanterns, Josef Maria Pisko recalled the period around 1840 as one when Nürnberg sent magic lanterns to "all the corners of the Earth by the thousands."¹³ Pisko's comment reinforces the early worldwide importance of Nürnberg as a source of toy lanterns, so familiar from later in the nineteenth century, but it also must have been the case that 'adult' lantern manufacture continued in parallel with the expanded market for children's optical amusements. In 1907 Karl Rosenhaupt wrote that the manufacture of magic lanterns in Nürnberg ranged from "the smallest types illuminated by a paraffin lamp up to those projection apparatus illuminated by electric arc lamps and limelight burners."¹⁴

All these hints and comments leave the impression of continuous production of full-sized magic lanterns for adults across the eighteenth century and into the era of the great tin toy manufacturing companies of the 1870s. But we have so far no clear indication of just what lanterns were being made in Nürnberg, what they looked like and who made them. The Bull's-Eye design seems a very good candidate to fill this void, especially given that the surviving lanterns are clearly made by several hands even though they have similar designs, and that they are anonymous.

Anonymity of manufacture was characteristic of the Nürnberg system until the second half of the nineteenth century, as goods of all types were normally made to the orders of a separate guild of salesmen or agents.¹⁵ The advantage to the craftsman or small workshop of working through an agent was that the agent normally supplied the raw materials to the craftsman and then took the shop's entire production, selling on the goods internationally in a way that small businessmen could not hope to imitate. This system also significantly reduced the risk to the craftsman that, in making goods for a fickle and fashionable market, he would be left with unsold products. Its principal disadvantage was the power of the wholesale agent to require a low-cost and high-volume article that left the craftsman powerless, with only the narrowest facility to put his own skilled mark on his product.

Craftsman production in Nürnberg was characterised by numerous small shops working to an overall pattern and scale of costs set by the agent or exporter. The agent decided with his retail customers just what the design and cost of an item would be, and then imposed this on the – often family-oriented – craft workshop. It was always possible for

a craftsman to individualise his products with a small distinction that would add neither time nor material cost: small flames at the top of a lantern chimney, for example, or perhaps a simple design hammered into a latch. The types of distinction shown by several of the surviving Bull's-Eye lanterns are exactly those that are common to Nürnberg workshop production. And because an apprentice system still flourished in Nürnberg until the mid-nineteenth century, there was no need for the written transmission of designs or craft skills, which was accomplished wholly within the shop culture. Nürnberg metalworkers had their own regular sources of raw materials from late medieval times, contracting for copper from Hungary and lead from the Harz mountains. Tin was originally obtained from mines in the Erzgebirge region on the border between Saxony and Bohemia and from Weissenstadt in Bavaria, and was also imported from Cornwall.¹⁶ The Nürnberg system featured a large number of workers who shared the same skills and could produce very similar products, closely packed into a single medieval city and its suburbs. It is not an exaggeration to see Nürnberg itself as the factory, populated with hundreds of craftsmen working from home or in small workshops as the needs of the product dictated, supplying household goods to the world via highly organised agents.

Printed Sources

In 2012, just as in the time when some of these lanterns were acquired by collectors or institutions, there is no real way to ascertain a good provenance for most of the eight surviving Bull's-Eye lanterns. They are variously called in the skimpy literature 'Dutch' if acquired in the Netherlands, 'English' if acquired in Britain, 'German' if acquired in that country. One lantern (No. 4) seems to have been at Chicksands Priory, Bedfordshire, U.K., since its original purchase. Still, one error of provenance might be dispelled here: Ernst Hrabalek, reproducing No. 3 in his book *Laterna Magica*, described it as a "magic lantern after Zahn," an appellation picked up by Pete Ariel in his text for No. 1.¹⁷ This is incorrect, as no Zahn lantern resembles this design. In fact, there is remarkably little published evidence of the existence of this design of lantern. For a type that was clearly made by a number of different workshops, this is most unusual. Throughout the seventeenth and eighteenth centuries, it was common either for an instrument maker to copy a published source in making a lantern, or for the author of a book to copy an actual instrument in his illustration. One clear example of this interplay of design and construction between author and craftsman can be seen in the superb lantern developed by Jan van Musschenbroek in collaboration with Willem Jacob van 'sGravesande and published by the latter in 1721, as instrument makers like Georg Friedrich Brander in Augsburg and Abbé Nollet in Paris,

amongst several others, subsequently offered “sGravesande magic lanterns” from their own workshops.¹⁸

With so (relatively) many Bull’s-Eye lanterns surviving, if this lantern did not have its origin in a single place, but instead was made by different workshops in different cities across Europe, it would be logical to expect that there would be substantial publication of the design. Either it would appear in an influential book which was then used by various independent makers who copied the design, or it would be published so frequently that it became a well-known design so widely circulated that it was taken up by secondary authors for their own works. But neither situation is in fact the case. Published illustrations of the Bull’s-Eye lantern are scarce. There seem to be just two publications of this Bull’s-Eye design, one from 1763 and the other from the mid-nineteenth century.

The first illustration (Fig. 9) is in Volume II of Benjamin Martin’s *Young Gentleman and Lady’s Philosophy*, which has a publication date of 1763 and would have been available around Christmas 1763 or early 1764. The illustration and text about the magic lantern in this book probably dates from 1762 or 1763, since it was the bound version of a monthly partwork *The General Magazine of Arts and Sciences* which Martin published between 1755 and 1763.¹⁹ This illustration differs from the classic Bull’s-Eye lantern only in showing the slide stage cut through the fat lens tube, instead of being placed at the junction of the body and the lens tube. The same plate was reused for the second edition of Martin’s book in 1772, and from 1791 it was copied in the ‘Dioptrics’ plate of the *Encyclopaedia Britannica* (Fig. 8), first in the ‘Dublin’ edition of that year and then, unchanged but re-engraved, in the third edition of 1797 and fourth edition of 1810.²⁰ So the question is: was the London instrument maker Benjamin Martin the source of this design of lantern? Although the evidence is circumstantial, it seems probable that this was not the case.

Benjamin Martin was the son of a Surrey farmer, a self-educated teacher of mathematics who began writing inexpensive books around 1734.²¹ He worked as a travelling science lecturer in the 1740s, ranging through southern England; by 1750 at the latest he was acting as salesman for philosophical and mathematical instruments, some being of his own improved design. He opened a shop in Fleet Street, London, in 1756, moved to larger premises in 1760, and continued to improve various instruments and to publish vigorously, ultimately issuing over 50 books and monographs. He supplied Harvard College with a large order of instruments in 1764, though by the end of that decade Martin was over 65 years old and his son was presumably the major figure in his business. His shop was declared bankrupt in January 1782, the shock of which may have contributed to his sudden death

early the next month. The auction of his effects, including “an astonishingly large quantity of all types of scientific instruments,” took ten days.²²

Martin is one of the best known and best-studied members of the London instrument trade during its most prosperous and influential century. According to J.R. Millburn, Martin developed his business with a number of innovative and new-to-the-trade concepts that included

advertising in London and provincial newspapers (an art then in its infancy), undercutting his competitor’s prices, giving discounts for cash purchases, monopolising the sale of globes, writing books and tracts boosting his wares, [and] giving public lectures in the evenings mentioning his products.²³

Martin was certainly capable of devising the Bull’s-Eye lantern and had the capacity to manufacture it or have it made for him. But while Martin was quick to notify the public, in his modern way, of instruments that he had improved, adapted, or invented, he did not pick out the magic lantern as such an instrument. The lantern was illustrated in his many publications only twice: early in his career in 1740, when he adapted the illustration of William Molyneux to explain the instrument²⁴ and, as already mentioned, in *The Young Gentleman and Lady’s Philosophy* in 1763. A lantern appears in Martin’s first detailed price list of 1757, and was listed in all his catalogues until 1780 at the same price of £1 1s 0d.

All Martin’s instrument catalogues were organised in four sections: *Philosophical Instruments*, *Optical Instruments*, *Mathematical Instruments*, and *Instruments Invented or Improved by B. Martin*. The magic lantern always appeared in the *Optical Instruments* section, never in *Instruments Invented or Improved by B. Martin*, a further indication that Martin was not the source of this design of lantern: he was not at all shy about declaring his improvements or alterations to existing instruments. Both the constancy of this listing in Martin’s catalogue and his lack of reference to the lantern in his other writings suggest that he was buying-in a standard lantern to which he had no personal attachment.²⁵

In 1740 Martin used a variation of Molyneux’s diagram from *Dioptrica Nova* to illustrate the magic lantern; in 1762-3 he illustrated the Bull’s-Eye lantern in his *General Magazine*. And it was only in the 1750s that Martin began seriously to manufacture scientific instruments from his new base in London.²⁶ The date of the introduction of the Bull’s-Eye lantern might be narrowed even further to some time between 1756 and 1760: J.R. Millburn characterises this important period in Martin’s career as a time when Martin “was running an extensive wholesale and retail business, rather than making instruments himself or just marketing his own products.” Millburn continues with the note: “How he managed to expand

so quickly is not entirely clear. . .²⁷ It is just at this time when his business enlarged rapidly, and when Martin was “running an extensive wholesale and retail business” that I want to suggest he began importing the Bull’s-Eye magic lantern from Nürnberg.

Nürnberg is the best suggestion for Martin’s source here, because if he had purchased his magic lanterns from within the London instrument trade, they would have been of an entirely different design. At the middle of the eighteenth century Martin could have bought in London only lanterns that looked very different from the Bull’s-Eye design. From about 1725 to about 1760 or so, the only design of magic lantern that seems to have been made in London had a tall cylindrical body. It also had a strongly columnar chimney on top of the body cylinder, and a double sloping band at its circular base, the upper band being perforated for air circulation. The long and quite fat lens tube had a supporting post near its mid-point, and there was an elegantly formed tubular handle at the back of the cylinder. This design can be most easily seen in the trade card of Edward Scarlett (c.1725). It also appears in the cards of John Bennet (c.1735) and Nathaniel Hill (1746 or later), and was used in the much later card of Dudley Adams (c.1800) who tried to emphasise the longevity of his business by illustrating the common form of instruments in use a generation earlier when his father George Adams was running the business. In fact, a form of this cylindrical lantern appears in a Benjamin Martin trade card dated c.1756.²⁸

It is particularly interesting that there is no other design of magic lantern illustrated in any trade card known from the London scientific instrument trade around the middle of the eighteenth century.²⁹ Fig. 15 illustrates the three surviving examples of this “London lantern” so often displayed on the trade cards of London’s instrument makers. Since a common design of microscopes, telescopes, spyglasses, or other instruments was not at all usual amongst the highly competitive London instrument-making community, I have suggested that there may have been a single shop or craftsman providing this form of lantern to the trade in these decades. If Martin was buying his magic lanterns from a London source, it would have been in the overall style and design of this ‘London’ lantern. This instrument cost £1 10s in 1739 when one was sold to King Gustav of Sweden, so a less expensive lantern that Martin had sourced outside London, which he then sold at a price of one guinea, would be wholly within his normal practice of undercutting his competitors’ prices. If this was a new and less expensive design that Martin had bought in from a central new London source, then the individual surviving lanterns should exhibit a conformity (or evolution) of design details that is not present in the eight extant lanterns. Through his own illustration of the Bull’s-Eye lantern, and its subsequent reproduction in *Encyclopaedia Britannica*, Benjamin Martin is the origin of all known illustrations of this type of lantern between 1763 and 1810, but at the

same time it would seem that he was neither the lantern design's originator nor its manufacturer.

The second illustration of a Bull's-Eye lantern is another tantalising item, ambiguous in its meanings like so much of the 'evidence' marshalled here. It appears in one of a number of colour lithographed printer's sheets, made for a salesman's sample book at the Nürnberg print shop of Friedrich Scharrer around 1860 (Fig. 13). This is very late indeed for the lanterns under consideration here. Scharrer was probably printing this *Musterbuch*, or samples catalogue, either for Wilhelm Friedrich Rau or for the firm of Rau & Rau operated by Wilhelm's brother Christoph Friedrich Rau. Both were making tin toys in separate firms in Nürnberg at the time.³⁰ Scharrer's plate shows a lantern quite similar to Nos. 1-8: square body, vertically corrugated chimney, fat lens tube. On the original Scharrer plate this lantern is called "Engl. Laterna magica", or 'English magic lantern'.³¹ There are only two possible interpretations: either the design was originally English and was copied in Nürnberg, or this is the style of lantern that was initially made in Nürnberg for export to the English market, and was therefore called 'Engl.' in the trade in Nürnberg. This lantern is also equipped with a slide stage for vertical slides, as illustrated in the box of painted slides behind the lantern, which makes it both a specialist item and a rare late appearance for the Bull's-Eye design. This is an odd, provocative illustration, never published, and existing only in the single original printer's plate, an exemplar which provides no answers.

One other illustration might also be mentioned: this is a diagrammatic sketch (Fig. 12) in a pamphlet found bound into Philip Carpenter's *Elements of Zoology* (1823) which described his new improved phantasmagoria lantern.³² The Bull's-Eye lantern is here called "The common magic lantern," and this illustration is mentioned here only due to the fact that because the book was in the Barnes Collection it is well known and has been published often, leading to a reinforcement of the idea that this was a standard English design in widespread use. Nonetheless, at the end of this review of published sources all that can be said without fear of contradiction is that in this case there are more surviving lanterns than there are contemporary illustrations of the design. This is not just unusual, it is unique.

Conclusion

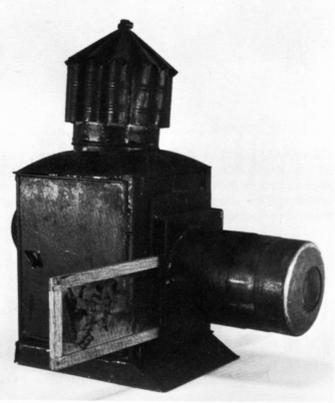
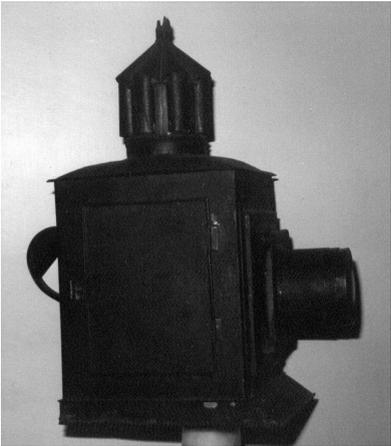
Eight magic lanterns from at least six different makers. Where did they come from? If there is not (yet) direct documentary evidence that they were made in Nürnberg's metal workshops, then where else? If the design did not originate from Benjamin Martin, then from whom? If Martin was buying these lanterns for his London shop, then from where? Nürnberg offers a credible answer to all of these questions.

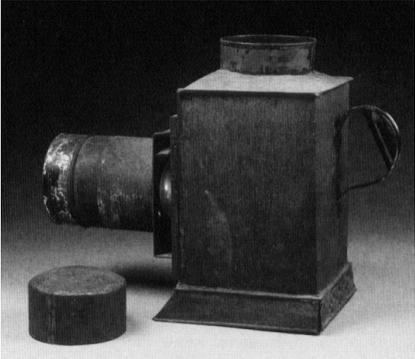
To postulate the spontaneous and independent appearance, during a period of thirty years or so, of this particular design of magic lantern in various countries across northern Europe would require a more credulous soul than mine. To suggest that the Bull's-Eye lantern was built with such conformity by widely separated makers implies an international circulation of precise information for which there is no evidence. The London instrument trade, during the eighteenth and early nineteenth centuries the most important in Europe, has been intensively studied and, while there are many mysteries yet to be solved, particularly about the workshops that supplied bulk instruments to named makers, there is no suggestion in any corner of the London trade that the Bull's-Eye magic lantern was a major component of its market, either by value or by volume.

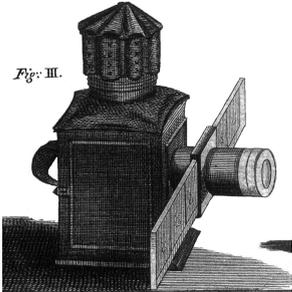
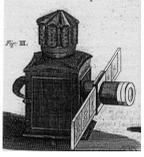
It is entirely possible that the arguments I have presented here are wrong, and that the close attention to the Bull's-Eye lantern's purveyors and its design has set off on the wrong foot in some way so that it has become a self-fulfilling prophecy, a web of intricate questions and counter-questions that have skewed the evidence and falsified the result. But for the moment I doubt that this is the case, and in the absence of any substantial alternative suggestion, until further evidence appears, I rest my case: the 'Bull's-Eye' magic lantern of the late eighteenth century, sold for the domestic enjoyment and amusement of its many purchasers across Europe, was a product of the metal workshops of Nürnberg.

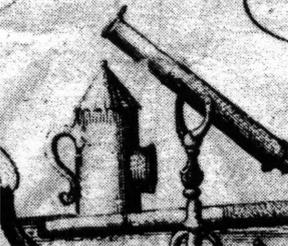
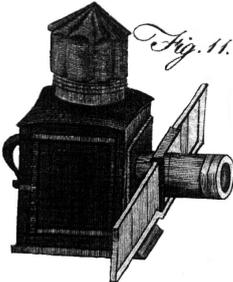
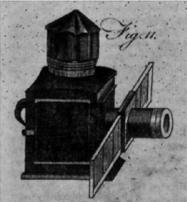
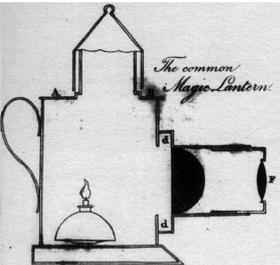
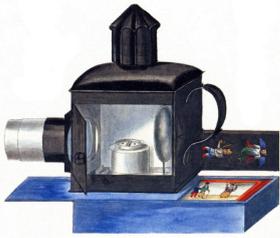
BULL'S-EYE LANTERN TABLES

<p><i>No. 1</i></p> 	<p>H (overall): 41 cm H (lamp): 25 cm W (overall): 17 cm W (lamp): 15 cm L (inc. lens): 30 cm L (lamp): 15 cm Weight: 2,5 Kg. Condensor Ø: 11cm Front lens Ø: 5 cm Slide stage: 12,5 cm</p> <p>Material: Tin with remnants of brown paint.</p> <p>Owner/Source dating: 1780±</p> <p>Provenance: Germany?</p> <p>Now in:: Germany, collection of Deutsches Filmmuseum, Frankfurt a. M.</p> <p>Image: ACR 1089</p>	<p><u>Similarities:</u> handle with insert support chimney (12 columns?) square lamphouse large dia lens tube two sliding sections in lens tube</p> <p><u>Variants:</u> interrupted sloping front pediment</p> <p><u>Notes:</u> Called "Laterna Magica nach Zahn"</p>	  <p>ACR 1089</p>
<p><i>No. 2</i></p> 	<p>H (overall): 41cm H (lamp): W (overall): 17,5 cm W (lamp): L (inc. lens): 30 cm L (lamp): Weight: Condensor Ø: 9 cm Front lens Ø: 3 cm Slide stage: 13 cm</p> <p>Material: painted metal [black]</p> <p>Owner/Source dating: 1790+</p> <p>Provenance: Originally sold by John Scott, 417 Strand, London</p> <p>Now in:: France, via Will Day Collection, Cinémathèque française</p> <p>Image: <i>Le mouvement continué</i> , #1183</p>	<p><u>Similarities:</u> chimney (12 columns?) square lamphouse large dia lens tube sloping front pediment two sliding sections in lens tube</p> <p><u>Variants:</u> larger side door than #1</p> <p><u>Notes:</u> Plate on front: "Scott. No. 417 Strand London"</p> <p>Mannoni later dated 1780-1790 in <i>Trois siècles de cinéma</i>, p. 96.</p>	

<p><i>No. 3</i></p> 	<p>H (overall): 15" (= 38 cm) H (lamp): W (overall): W (lamp): L (inc. lens): L (lamp): Weight: Condensor Ø: Front lens Ø: Slide stage:</p> <p>Material: Tin</p> <p>Owner/Source dating: Late 18th century</p> <p>Provenance:</p> <p>Now in:: USA, Dick Balzer Collection</p> <p>Image: <i>Optical Amusements</i>, 5</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment large side door as No. 2 chimney (10 columns?) two sliding sections in lens tube</p> <p><u>Variants:</u></p> <p><u>Notes:</u> Richard Balzer Collection also in Hrabalek, p. 23</p>	
<p><i>No. 4</i></p> 	<p>H (overall): 41 cm H (lamp): 30 cm W (overall): W (lamp): 24 cm L (inc. lens): L (lamp): 24 cm Weight: Condensor Ø: 9,4 cm Front lens Ø: 4,3 cm Slide stage:</p> <p>Material: Tin painted very dark green</p> <p>Owner/Source dating: Late 18th century</p> <p>Provenance: Chicksands Priory, Bedfordshire, UK</p> <p>Now in:: UK, Lester Smith Collection</p> <p>Image:Lester Smith photo</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment smaller side door as No. 1 handle with insert support chimney (10 columns?) two sliding sections in lens tube</p> <p><u>Variants:</u> four flames cut in tin at top of chimney door catch of flat tin nicely curled</p> <p><u>Notes:</u> Lester Smith Collection</p>	

<p><i>No. 5</i></p> 	<p>H (overall): 44 cm H (lamp): W (overall): W (lamp): 17,5 cm L (inc. lens): 37 cm L (lamp): Weight: Condensor Ø: Front lens Ø: Slide stage:</p> <p>Material: painted tin [black?]</p> <p>Owner/Source dating: Late 18th or early 19th century</p> <p>Provenance: Barnes Collection, St. Ives</p> <p>Now in:: Turin, Italy, collection Nazionale Museo del Cinema</p> <p>Image: <i>A Magia da Imagem</i>, 196</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment larger side door as Nos. 2,3 chimney (8 columns?) two sliding sections in lens tube</p> <p><u>Variants:</u></p> <p><u>Notes:</u> Collection Museo Nazionale del Cinema, Turin</p> <p>Two further bull's-eye lanterns in this exhibition, not illustrated; a) 42x20x35 cm, b) 70x22x46 cm</p> <p>Turin: "English lantern"</p>	
<p><i>No. 6</i></p> 	<p>H (overall): H (lamp): W (overall): W (lamp): L (inc. lens): L (lamp): Weight: Condensor Ø: Front lens Ø: Slide stage:</p> <p>Material: tin painted matt black</p> <p>Owner/Source dating: Late 18th century</p> <p>Provenance: The Netherlands</p> <p>Now in:: Germany, Werner Nekes Collection</p> <p>Image: <i>Ich sehe was, was du nicht siehst!</i>, 148</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment handle with insert support two sliding sections in lens tube</p> <p><u>Variants:</u> lovely leaf-pattern door catch</p> <p><u>Notes:</u> Werner Nekes Collection</p> <p>Nekes: "Dutch lantern"</p> <p>Very tall, upright square lantern</p>	

<p>No. 7</p> 	<p>H (overall): 42,5 cm H (lamp): 23 cm W (overall): 17 cm W (lamp): 17 cm L (inc. lens): 38 cm L (lamp): 16,5 cm Weight: Condensor Ø: 10 cm Front lens Ø: 4 cm Slide stage: 13 cm</p> <p>Material: Tin</p> <p>Owner/Source dating: c1800; my date: c. 1810</p> <p>Provenance: bought France c1997</p> <p>Now in:: Martin Gilbert collection</p> <p>Image: Martin Gilbert</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment large side door as No. 2 two sliding sections in lens tube</p> <p><u>Variants:</u> so-called 'phantasmagoria' chimney</p> <p><u>Notes:</u> simple bent-wire door catch Martin Gilbert Collection Seems to be standard Bull's-Eye lantern w/ primitive phantasmagoria design chimney. Vertically adjustable lens tube and slide stage combination; lifts off.</p>	
<p>No. 8</p> 	<p>H (overall): H (lamp): 26cm W (overall): W (lamp): L (inc. lens): 34cm L (lamp): 14,5cm Weight: Condensor Ø: 7cm Front lens Ø: 3,5cm Slide stage: 9cm</p> <p>Material: tin</p> <p>Owner/Source dating: c1810</p> <p>Provenance:</p> <p>Now in:: United Kingdom, John W. Taylor collection</p> <p>Image: J. W. Taylor to NMLJ V10N2p34</p>	<p><u>Similarities:</u> square lamphouse large dia lens tube sloping front pediment large side door as No. 2 two sliding sections in lens tube</p> <p><u>Variants:</u> so-called 'phantasmagoria' chimney; small ball feet under pediment</p> <p><u>Notes:</u> simple bent-wire door catch (JT says similar to later Wrench)</p>	 <p>Detail showing adjustable lamp fitting</p>
<p>No. 9</p> 	<p>Image: Benjamin Martin, <i>The Young Gentleman and Lady's Philosophy</i>, 1763, Vol. II, Plate L, Fig. 3</p>	<p>At least in the engraving, the slide stage is not at the join of the lamp and lens tube, but is situated wholly within the tube itself. Does this reflect the South German practise as seen in the Griendel horizontal cylinder lantern???</p>	<p>2nd ed., 1772, identical</p> 

<p><i>No. 10</i></p> 	<p>Benjamin Martin, trade card, c. 1756</p> <p>Image: H. R. Calvert, <i>Scientific Trade Cards in the Science Museum Collection</i> (London, 1971), No. 34.</p>	<p>Martin's only trade card, used throughout the existence of his London shop.</p>	
<p><i>No. 11</i></p> 	<p>Image: <i>Encyclopaedia Britannica</i>, Dublin Edition, 1791, Pl. CLXII</p>	<p>Taken from Martin, No. 7</p> <p>Camera obscura on same plate in Dublin, 3rd and 4th editions is also taken from same plate in Martin.</p>	 <p><i>Encyclopaedia Britannica</i>, 4th ed., 1810, Pl. CLXXV, also in 3rd ed 1797</p>
<p><i>No. 12</i></p> 	<p>Image: Philip Carpenter, "A Short Account of the Copper-Plate Sliders, and a Description of the Improved Phantasmagoria Lantern...", in: <i>Elements of Zoology</i>, London, 1823 [from <i>Light and Movement</i>, p. 125]</p>	<p>Carpenter: "The common Magic Lantern" [as opposed to his improved Phantasmagoria lantern]</p>	
<p><i>No. 13</i></p> 	<p>Printer's proof for Nürnberg Musterbuch, c. 1860.</p> <p>Image: Christa Pieske, <i>Schöne alte Spielzeug</i>, p. 131.</p>	<p>c. 1860, printed by Friedrich Scharrer probably for the firm of Rau.</p> <p>Original page of catalogue calls this "Engl. magic lantern"</p> <p>Note vertical long slide; some survive in private collections</p>	

No. 14

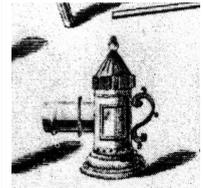


Edward Scarlett, trade card, c. 1725 (detail).

Image: David Robinson, *Lantern Images* (London, 1993), p. 18, No. 28; or, H. R. Calvert, *Scientific Trade Cards in the Science Museum Collection* (London: 1971), No. 43.



John Bennet, trade card, c. 1735 (det.)



Nathaniel Hill, trade card, c. 1746 (det.)

No. 15



Left: A surviving 'London lantern' now at the Museum Gustavianum, Stockholm. Purchased in London for £1 10s in October, 1739.



A London lantern at the National Museums of Scotland, Aberdeen.



A London lantern now in the USA. Dick Balzer collection.

NOTES

I am most grateful to the collectors and institutions who supported the original publication of this article in the *New Magic Lantern Journal*, and to those collectors who brought additional lanterns to my attention after its publication. These include Richard Balzer, the late John Barnes, Martin Gilbert, Werner Nekes, Lester Smith and John Taylor.

- 1 In 1698 or 1699 Karl, Landgrav of Hesse-Cassel, bought four lanterns in Southern Germany while on a long trip to Italy and back. All four are based on the horizontal cylindrical form established in Nürnberg by Griendel in 1671, and two are virtually identical. This is the only other early lantern design that survives in multiple copies.
- 2 To date I have examined 93 lantern illustrations from 59 seventeenth- and eighteenth-century works by 53 authors, including variants between editions.
- 3 The term may be based on the lantern's general similarity to the nineteenth-century 'bull's eye' hand lamp, which in turn was named for the shape of its thick convex lens. There is no evidence that this design of magic lantern was known by this name at the time of its manufacture, and the earliest *OED* citation for "bull's-eye lantern" (meaning a hand lamp) is from 1851.
- 4 Gloria Clifton, *Directory of British Scientific Instrument Makers 1550-1851* (London: Zwemmer, 1995).
- 5 Hecht, Hermann (ed. Ann Hecht), *Pre-Cinema History: an Encyclopaedia and Annotated Bibliography of the Moving Image before 1896* (London: Bowker Saur, 1993), item 98A.
- 6 Griendel's list of 25 instruments was included in a letter to Leibniz of 30 December 1671. The letter is in Ernst Gerland, *Leibnizens nachgelassene Schriften physikalischen, mechanischen und technischen Inhalts* (Leipzig: 1906), Bd. 1, S. 201-204, Brief Nr. 99, but the list of instruments is not printed. I am very grateful to Inge Keil for a copy of this list, which is at the Leibniz Archiv, Landesbibliothek Hannover. A printed list of Griendel's instruments from 1672 has recently been identified, and reproduced in full in my *Lanterna Magica - Magic Lantern, Eine Geschichte - A History*, Band 1 - Volume 1 (Fuesslin Verlag, 2008) pp. 57-61.
- 7 Wilhelm Bahr, *Der Nebelbilder-Apparat, seine Handhabung und die Anfertigung transparenter Glasbilder* (Leipzig: 1875), 4.
- 8 Christoff Weigel, *Abbildung und Beschreibung der gemein-nützlichen Hauptstände* (Regensburg: 1698; reprinted Nördlingen: Uhl Verlag, 1987), 382.
- 9 Inge Keil, *Augustanus Opticus: Johann Wiesel (1583-1662) und 200 Jahre optisches Handwerk in Augsburg* (Berlin: Akademie Verlag, 2000), 190.
- 10 Georg Wenzel, *Die Geschichte der Nürnberger Spielzeugindustrie* (Dissertation: Friedrich-Alexander Universität Erlangen-Nürnberg, 1967), 44. "Lacquerers" is the awkward English word I have chosen for Wenzel's use of the Nürnberg craft term "Weißmacher," literally "white-maker." This Nürnberg craft did the final painting and decoration on metal goods that had been produced by tinsmiths.
- 11 P.F. Catel, *Mathematisches und physikalisches Kunst-Cabinet, dem Unterrichte und der Belustigung der Jugend gewidmet*. (Berlin and Libau: 1790), Tab. III, No. 76.
- 12 J.G.Fr. Jacobi, *Neues vollständiges und allgemeines Waaren- und Handlungs-Lexicon . . .*, Vol. 2, (Heilbronn and Rothenburg: 1798), 188.
- 13 Jos. Pisko, *Licht und Farbe: Eine gemeinfaßliche Darstellung der Optik* (München: 1869), 154.
- 14 Karl Rosenhaupt, *Die Nürnberg-Fürther Metallspielwarenindustrie in geschichtlicher und sozialpolitischer Beleuchtung* (Stuttgart and Berlin: 1907), 79.
- 15 This paragraph is a brief summary based on Rosenhaupt, op. cit.; Ekkehard Wiest, *Die Entwicklung des Nürnberger Gewerbes zwischen 1648 und 1806* (Stuttgart: G. Fischer, 1968); Louis Constantin Beck, "Die Fabrikindustrie Nürnbergs", in *Festschrift zur 40. Haupt-Versammlung des Vereins Deutscher Ingenieure in Nürnberg, vom 11- 15 June 1899* (Nürnberg: 1899) and other works.
- 16 Beck, op. cit., 381.

Ernst Hrabalek, *Laterna Magica: Zauberwelt und Faszination des optischen Spielzeugs* (München: Keyser, 1985), 23. Hrabalek's caption reads: "Laterna magica nach Zahn, spätes 18. Jahrhundert." Pete Ariel, *Ariel Cinematographica Register*, Vol. 4, (Frankfurt: Deutsches Filmmuseum, 1981-2000), item ACR1089. Here the lantern is called "Laterna Magica nach Zahn" and Hrabalek is given as a source.

Willem Jacob van 'sGravesande, *Physices elementa mathematica, experimentis confirmata*, Vol. 2, (Leiden: 1721). The lantern and its optical system are illustrated on Tab. XIV and discussed on pp. 72-75. See also Peter de Clercq, *At the Sign of the Oriental Lamp: the Musschenbroek Workshop in Leiden, 1660-1750* (Rotterdam: Erasmus Publishing, 1997), 73-102. Brander's list of instruments was attached to a letter of 7 June 1753 to J.F.A. Uffenbach, and is transcribed in Aldo Brachner (ed.), *G.F. Brander, 1713-1783: Wissenschaftliche Instrumente aus seiner Werkstatt* (München: Deutsches Museum, 1983), 341. For Nollet, see *Leçons de Physique Experimentale* (Paris: 1743). The Zürich clockmaker and optician Johann Steiner also offered "magic lanterns according to Herr Gravesand's suggestions"; see Johann Ludwig Steiner, *Kurze Abhandlung von den Vergrößerungs-Gläsern* (Zürich: 1748), foreword.

The leading Martin scholar John R. Millburn suggests that the page numbers relating to the magic lantern in *The Young Gentleman and Lady's Philosophy* indicate an original publication in the *General Magazine* in 1762 or early 1763 (John R. Millburn, letter to the author, 20 June 2003).

Encyclopaedia Britannica: or, a Dictionary of Arts, Sciences, and Miscellaneous Literature, Dublin edition (1791), entry "Dioptrics," Vol. VI, Plate CLXII, Fig 11. The entire plate was re-engraved for the 1797 third edition (Vol. VI, Plate CLXII, Fig 11), and again for the 1810 fourth edition (Vol. VII, Plate CLXXV, Fig. 11). The illustration from Martin does not appear on the "Dioptrics" plate in Vol. 4 of the second edition (1779) or the first edition (1771).

This paragraph is based on John R. Millburn, *Benjamin Martin: Author, Instrument-Maker, and 'Country Showman'* (Leiden: Noordhoff, 1976); Millburn, "The London Evening Courses of Benjamin Martin and James Ferguson, Eighteenth-Century Lecturers on Experimental Philosophy," in *Annals of Science* 40 (1983), 437-455; and especially Millburn, *Retailer of the Sciences: Benjamin Martin's Scientific Instrument Catalogues, 1756-1782* (London: Vade-Mecum, 1986).

Millburn, *Retailer of the Sciences*, 23.

Millburn, *Retailer of the Sciences*, 19.

Benjamin Martin, *A New and Compendious System of Optics* (London: 1740). The magic lantern is illustrated in Plate XXXIV, Fig. 1, adapting the often-copied illustration from William Molyneux, *Dioptrica Nova* (London: 1692) with a vertical cylinder lantern topped by a conical chimney. The lantern is discussed in Chapter XVIII, pp. 292-5.

For example, the solar microscope, which Martin made himself and to which he made some ingenious improvements, is discussed in several of his works, such as *Description and Use of a Case of Instruments* (1771), and *An Account of the Camera Obscura and the Solar Microscope*, which was bound with *Micrographia Nova* (1742). In the latter, as in most other cases, Martin did not even mention the magic lantern, which seems to have been of little personal interest to him.

While in the provinces Martin had developed, made and marketed a pocket microscope and universal microscope (1738-40), both of which disappeared from his publications and advertisements after 1743. In the 1740s and until the mid-1750s he concentrated wholly on lecturing and teaching (Millburn, *Retailer of the Sciences*, 16-17). However according to Millburn, around 1750 Martin "was apparently acting as a travelling salesman for instruments, as a sideline to itinerant lecturing, . . . presumably he just collected orders on his travels, to pass on to the trade in London or elsewhere for execution, on a commission basis." (ibid., 17).

Millburn, *Retailer of the Sciences*, 19.

Scarlett and Bennet's cards are illustrated in David Robinson (comp.), *The Lantern Image: Iconography of the Magic Lantern 1440-1880* (London: Magic Lantern Society, 1993), items 28 and 38. The other cards mentioned here are illustrated in H.R. Calvert, *Scientific Trade Cards in the Science Museum Collection* (London: HMSO, 1971), illustrations 27 (Hill), 1 (Adams) and 34 (Martin). The images in the Adams card are discussed in Michael Crawforth, "Evidence from Trade Cards for the Scientific Instrument Industry," *Annals of Science* 42 (1985), 453-554. Three lanterns of this design

survive, two of them badly deteriorated.

29 There are only two or three known representations of this type of lantern in the general run of
illustrations in posters, the popular press, or caricatures. See *The Lantern Image* items 97, 106 and 129.
Two of these are clearly British (106 and 129) while the third has been attributed to France; it is more
likely that this item is also British, on the basis of its lantern. If the attribution to France is correct, it is
the only representation of this style of lantern known to be made outside London.
30 On the intended customer for this *Musterbüch*, see the introduction to Christa Pieske (ed.), *Schönes
Spielzeug aus alten Nürnberger Musterbüchern* (München: Morion, 1984).
31 I am grateful to Lester Smith for a photograph of the original plate as exhibited some years ago at the
Germanisches Nationalmuseum, Nürnberg. The plate is reproduced (without its caption) in Pieske, op.
cit., 131.
32 “A Short Account of the Copper-Plate Sliders, and a Description of the Improved Phantasmagoria
Lantern”, in Philip Carpenter, *Elements of Zoology* (London, 1823), frontispiece to the bound-in essay
in the Barnes Collection. This article is reproduced in Laurent Mannoni, Donata Pesenti Campagnoni
and David Robinson (eds), *Light and Movement: Incunabula of the Motion Picture 1420-1896*
(Gemona: Giornate del Cinema Muto, 1995), 125-131.