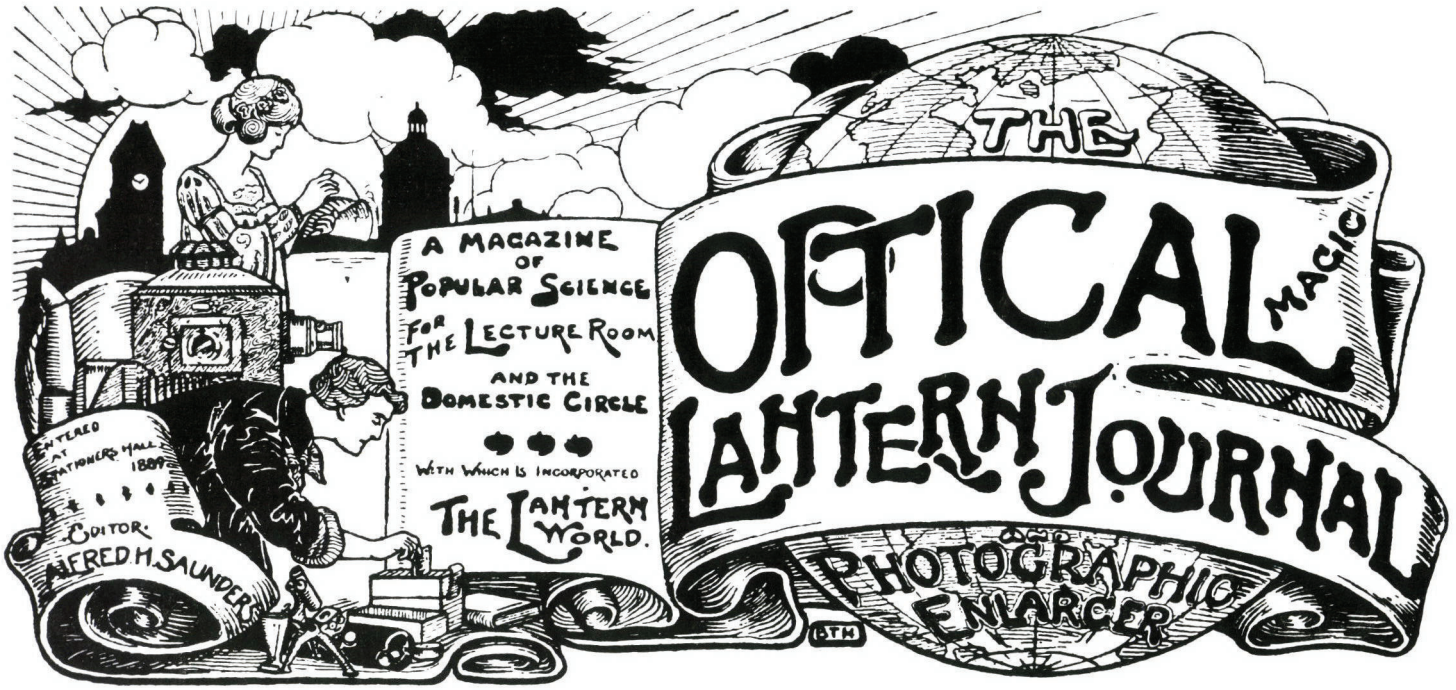


Volume 6 — Number 1 **THE NEW MAGIC LANTERN JOURNAL** *January 1989*

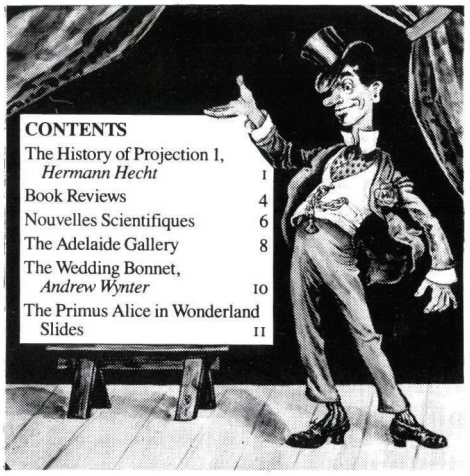
THE HISTORY OF PROJECTION AND LIGHTING IN THE THEATRE

This is the second of the texts of five lectures which the late Hermann Hecht delivered under this general title to theatre students at Croydon College of Art in 1985. See Vol. 5 No.3 page 10 for lecture 1.

Lecture 2

THE HISTORY OF PROJECTION 1

HERMANN HECHT



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When I talk to people who know that I am interested in the magic lantern, the first thing they ask me is: 'When was it invented and who invented it?' But the answer, as it is with all inventions, isn't that simple – there are different routes that led to the invention which happened in different places all over Europe within the span of a few years in the 1650s and 1660s. There are in fact three distinct paths which led to the invention of the magic lantern, the first came from the knowledge of, and from experiments made with, plane and concave mirrors, the second led to the lantern by way of the camera obscura, the ancestor of our photographic camera, and the third has its origin in the common dark-lanthorn or bull's-eye lantern.

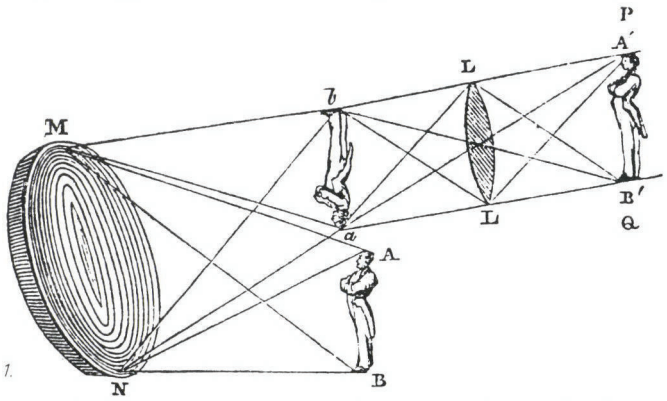
Let us first of all have a closer look at mirror-projection. It has been said that in ancient Greece and Rome, plane and concave mirrors were used to produce the manifestations of gods, and spirits of the dead.

It is quite possible to project the image of a person or thing in the air – as a free-floating three-dimensional image – using concave mirrors. This diagram (1) shows how the picture of the person (AB) is projected by concave mirror (MN) and then, using a lens, the image which is upside down is made sharp (focused) and stood on its feet again.

These tricks were used well into the nineteenth century to make people appear as anything the showmen wanted. In this engraving (2) the gentleman looks into the mirror but what he sees is a skeleton which is projected with the concave mirror behind the scene, on to the glass. A little model of a skeleton is hung upside down behind the partition and that is then projected the right way up.

About 100 years BC, Heron of Alexandria, whom we must consider the father of many mechanical and optical stage-illusions, described an arrangement of plane and concave mirrors where the spectator sees the image of the hidden actor appear above the altar, reflected by two mirrors. All you need is an actor dressed up as a god or spirit and let him or her perform in a god-like manner, or you can scale the arrangement down, which is much more likely, and use puppets and you can fool all your Greeks all the time! A similar arrangement was used some 1900 years later by John Henry Pepper, but we will deal with this in greater detail in a later lecture.

By the sixteenth century all this was common knowledge among the soothsayers and what we now politely call 'natural philosophers', but since it was a trick of the trade of these latter-day magicians, little was written about it, only hinted at as a secret. The same is of course still true today and it is just as unlikely to have Paul Daniels's tricks explained in the *Radio Times* every week. So it was not until 1646 that we have a reliable illustration and explanation.



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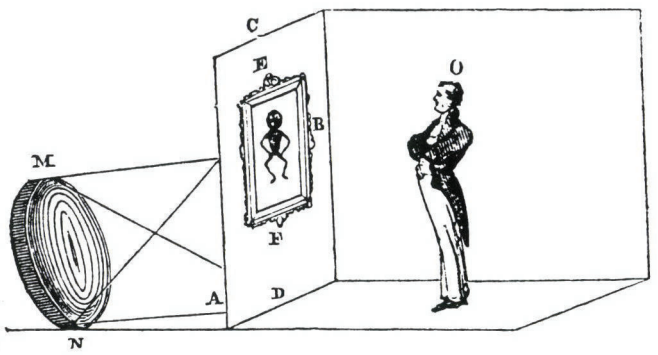

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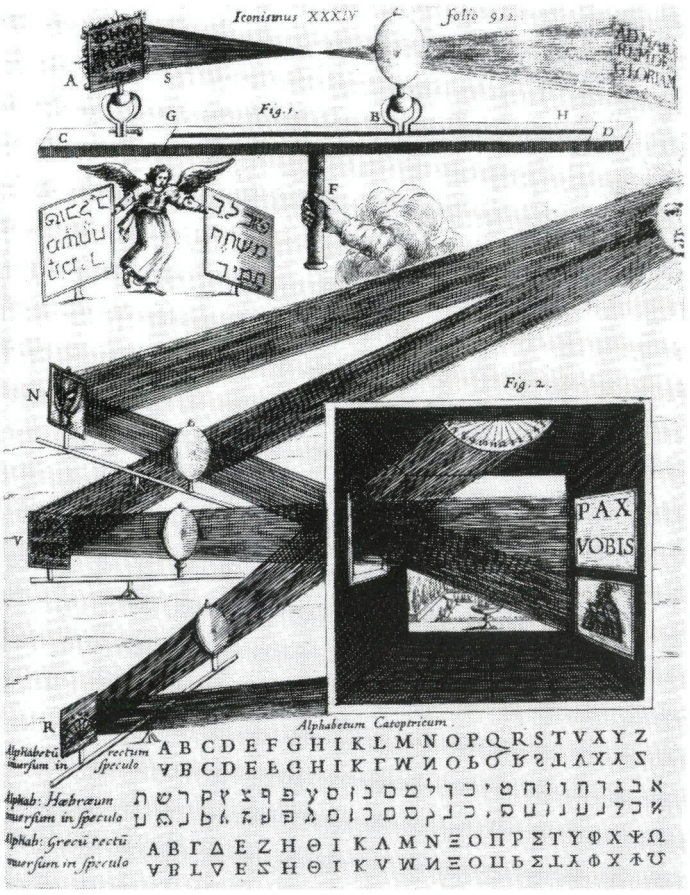

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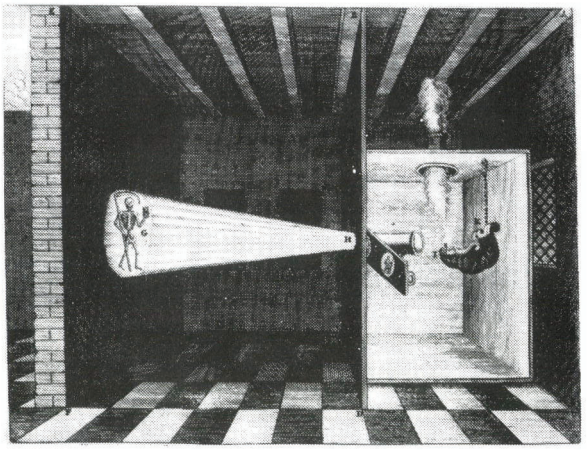

8.

5.

The picture (3) is from Athanasius Kircher's book *The Magic Art of Light and Shadow* and it shows the first primitive mirror projection arrangement at the top. It has a movable mirror at one end, a lens in the middle which can also be moved to focus the image and everything arranged neatly in a holder – a sort of primitive optical bench. By painting the lettering on the mirror you could project at very much enlarged size anywhere you wanted to. Kircher also shows us how to project pictures of real things and what appears to be a sun-dial from outside into a darkened room. He also provided upside down and mirror-reversed Roman, Hebrew, and Greek alphabets for the benefit of his readers who wanted to make similar experiments. He also stuck a living fly with honey on to a mirror and frightened the living daylight out of his enemies when they suddenly saw a huge beast crawl over their living-room wall.

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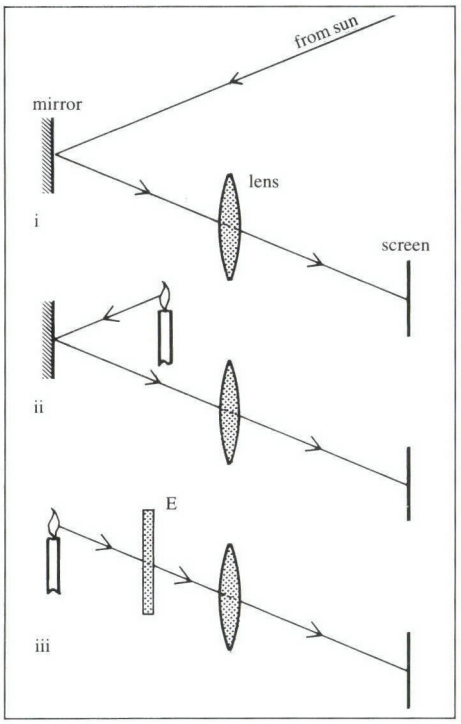


I have made this diagram (4) to show the development from Kircher's projection arrangement to the magic lantern proper. In the first, sunlight is used, just as we have seen it in the illustration from Kircher's book; by replacing sunlight with candlelight (2nd diagram) we can get a similar result only that we can use it at night. So far so good, but the problem is that every time you want to change the picture, you have to wipe off the previous one and paint another on the mirror. The difficulty can be overcome simply enough (in hindsight anyway) by painting the picture on a piece of glass (E in diagram 3) which can be interchanged and placed between the light-source and the lens (which can now be used directly, without the mirror). Now all you have to do is build a box around it and you have a magic lantern!

We'll now look at the second path, that of camera obscura projection: in its simplest form (5), the camera obscura (which originated in China and dates from about the time of the birth of Christ) consists of a small hole in a wall which acts as a lens would and the picture outside is projected upside down on the wall opposite – simple! I have seen photographs taken that way, simply with a pin-hole camera and the picture is perfectly sharp. I say this, just in case you don't believe me. To improve the quality of the picture you need to put a lens in the hole (which was first done in 1568 by Daniel Barbarro) and to improve it still further you have to do something to turn the picture the right way up. You can do that by using a concave mirror, put that in the path of the light rays from the lens and, instead of projecting the image of a solid object, you project an already existing image.

This is a picture of Giovanni Battista della Porta (6), the man who in 1589 first described the method. Porta was very fond of secrets – he even founded an Academy of Secrets – and he staged complete scenes as in a theatre in front of a darkened room either in bright sunlight or at night by torchlight. He projected entire battles and hunting scenes; he used artificial properties and miniature scenery to give the effect of depth and dressed up his actors. His delighted and usually absolutely terrified audiences hardly knew whether what they saw was true or only an illusion. So by the beginning of the seventeenth century itinerant troupes of actors travelled all over Europe with large transportable camera obscuras which they erected at fairs and markets, to give what we can perhaps best describe as 'portable life plays on a flat screen'. No magic lantern, no hand-painted slide could even begin to compete with the effects of these shows, but when necessary and when you couldn't stage a certain scene, you could put a painted glass picture in front of the lens of the camera – and a light behind it – to show that scene to the audience. Now you have another primitive version of the magic lantern, but on a very large scale, that is a lantern the size of a room, but, even so, a proper projection instrument.

We now come to the third path that led to the invention of the lantern. Its origin is in the ordinary lanthorn (the kind of thing that policemen always carry in Sherlock Holmes pictures). Fontana, an Italian engineer, in 1420 was the first to show how a picture could be projected with an ordinary lanthorn. The man holds a cylindrical lantern and on the outer circumference, which in those days was made of horn, the picture of a devil is minutely painted and the shadow is then thrown on a wall

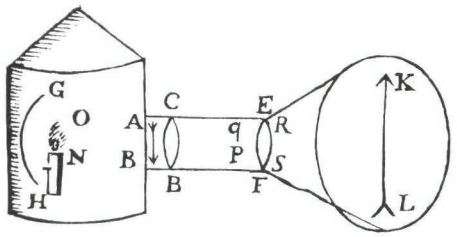
6.

to frighten off the enemies. Scaring them to death was probably an improvement on killing them! By adding a lens to the lanthorn as Leonardo had described a little later, and painting a picture on the lens, you get a sharper image, and by putting a painted picture between the candle and the lens, you have yet another magic lantern. Luckily for us, a Frenchman, Balthasar de Monconys kept a diary of his travels which had taken him all over Europe. His entry for the 17th of May 1663 when he was in London reads: **After we had eaten, we went to Long Acre to see Mr Reeves who makes telescopes. But he had none ready and deferred us to another time and also to show us how a bull's-eye lantern works.**

De Monconys then describes the lantern in detail. Samuel Pepys in his famous diary has an entry dated two years later in which he tells us that Reeves had been to see him and had shown him a **Lanthorn with pictures on glass to make strange things appear on a wall which bethought me very pretty** which he bought two days later.

I would like to believe that the lantern was invented by Reeves who supplied optical instruments to members of the Royal Society, but it seems likely that he got the idea from somewhere else. This may well have been Christiaan Huygens who visited him in 1661 and again in 1663. Huygens was an eminent Dutch physicist: he invented the pendulum clock (although Galileo had given him a few hints), he discovered the rings of Saturn, and the undulatory theory of light (i.e., that light moves in waves) among a host of other things to which we must add the magic lantern. This existed at the latest in November 1659. His father kept on pestering him to send him a lantern so he could, as he put it, 'frighten his friends with it', but his son was rather ashamed of the thing whose only use was to frighten people and he never sent it, nor did he ever publish details of it; we only know about it from his correspondence and notebooks he kept at the time.

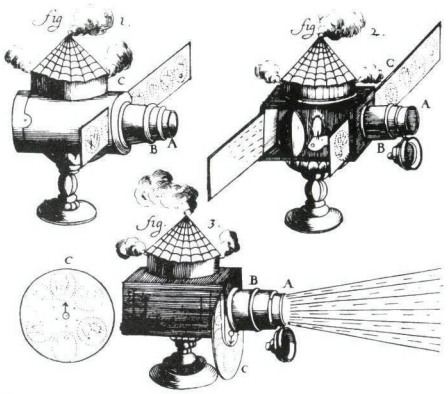
A friend of Huygens, a Danish mathematician, Rasmussen Walgenstein had fewer scruples, he not only built lanterns, but also gave public performances with them and sold them all over Europe.



7.

Luckily, we have an illustration of his lantern (7). It is simplicity itself and the prototype of every projection instrument ever made. (GH) is the concave reflector, (AB) the slide, (CB) the condensing lens – it should be (CD) – (EF) the second lens and (KL)the projected picture. The first description I have found dates from 1662 and it was referred to as *The Lantern of Fear*. In 1670 Walgenstein gave a magic lantern show before King Frederick III of Denmark and among the pictures shown to the Court was a figure of Death. Three days later the King died – let this be a solemn warning!

Both Huygens's and Walgenstein's lanterns developed from the mirror-projection arrangements described by Kircher. So this clever Jesuit priest (I don't mean this in a derogatory sense!) in the second edition of his book which was published in 1671 had to somehow claim that he had thought of it first, and that, in any case, his lantern was not only better, but very much larger. It was in fact much more like a camera obscura and took up an entire room (8). This is the picture that is shown in all the histories of the cinema as being the first one to show a magic lantern and Kircher is usually said to have been the inventor of it. But we have seen that the details were not published until twelve years after Huygens had a lantern, nine years after Walgenstein had one, and six years after Samuel Pepys bought one from Reeves. This kind of lantern, if it ever existed, certainly did not come into use since it had no advantages whatever over the portable magic lanterns being manufactured at the end of the seventeenth century. Just for the record, it was the prototype of the very much later projection-booth in the cinema.



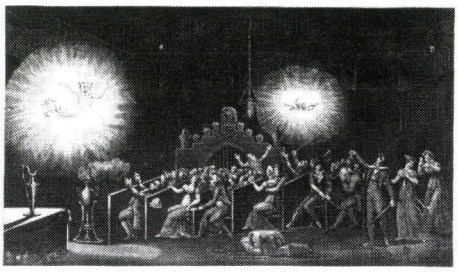
9.

In 1685 Johannes Zahn published an optical treatise in which he illustrated a variety of lanterns (9).

This type of lantern was manufactured in Nürnberg and Augsburg in Germany from about 1670. The circular disc slide is worth noting; this made it much easier to change the pictures and was still used in the mass produced toy lanterns of the late nineteenth and early twentieth century.

A particularly pleasant pastime for the well-to-do at the end of the seventeenth century was to use the lantern for showing the time at night (10) – the so-called projection-clock where the dial is painted on a rotating glass slide which is turned by clockwork. The dial is fixed and the clock face turns around it. This, in a sense, was the first moving picture and a very useful gadget which only within the last decades has come into general use as our electronic clock radio and cassette player.

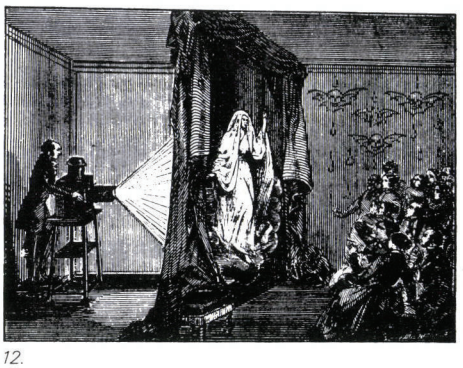
Most people were quite unaware of the optical properties of the lantern and this gave a unique opportunity for every crook and magician to use the instrument for his own purposes. One of the most successful of these was a Leipzig coffee-house owner called Schröpfer who convinced the participants in his seances that he could bring back the spirits of their dead relations. To show the ghosts, Schröpfer used back-projection on to smoke which issued from a sarcophagus. You also had assistants in the next room yelling and speaking into a pipe which ended inside the sarcophagus, and even to answer questions put to the spirits by the audience. Shortly after the French Revolution these ghost performances achieved the ultimate in presentation and success with Gaspard Etienne Robertson – he came from Liège in Belgium and his real name was Robert, but he thought that an English stage-name was more appropriate.



11.

In a sinister disused cloister of an old Capucine chapel in Paris (11) he gave performances of his Phantasmagoria, the name he gave it and which has now become part of our language. A dim light is just sufficient to recognise the tombstones, skulls, and skeletons – all stage properties, very carefully arranged in the auditorium – then the lights, which were dismal enough, were extinguished and the depressing stillness is broken by the sound of a howling storm and thunder (well-tried stage effects) and a faint light appears far off.

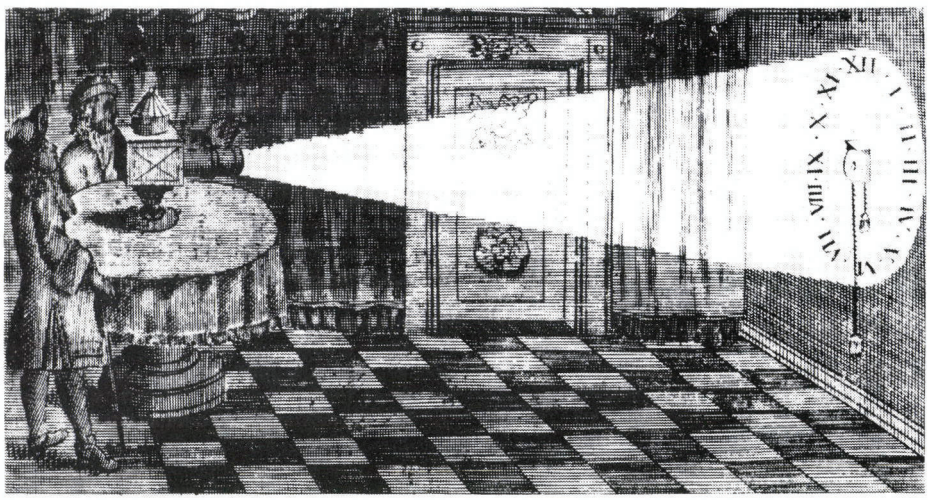
Death approaches and at last the horrifying image stands huge before the audience – a scream is heard – the phantom vanishes and small winged skulls appear everywhere among the audience. How did Robertson produce these soul-appalling spectacles? What kind of stage magic was it? Well, the answer, as no doubt you have already guessed, was to use a magic lantern and back-projection on to a transparent screen for the large pictures and small hand-held lanterns for the winged skulls projected into the audience from hidden side-wings.

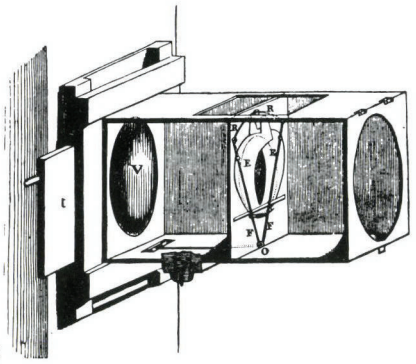


12.

The lantern he used, he called it a 'Phantascope', was mounted on a projection stand on wheels (12) and to produce the ghosts and skeletons the lantern at first stood near the screen and as it was wheeled back, the size of the picture steadily increased – the kind of effect we would now get with a zoom-lens. It is really quite simple, although the instrument was very well constructed.

10.





13.

The lens (13) had a diaphragm so that the light could be reduced while the lantern was near the screen and turned full up when furthest away (EE). A coloured glass screen could be inserted at (V) for special effects or to superimpose another picture – a sort of dissolving view effect which we are going to discuss another time. To insert different focal length lenses, the whole system could be removed and replaced with another one. For example, Robertson used microscope projection, so that a small insect could be very much enlarged and appear like some incredible monster on the screen!

PHANTASMAGORIA
THIS and every EVENING,
AT THE
LYCEUM, STRAND.

14.

In the winter of 1801 the Phantasmagoria came to London. They were introduced by the conjurer Paul de Philipsthal (that wasn't his real name!) at the Lyceum theatre in the Strand. This illustration is from his play-bill (14). The show was so popular that similar phantasmagoria sprang up all over London and the provinces, even Madame Tussaud had a travelling phantasmagoria and waxwork show. Together with Philipsthal they appeared in Ireland and the Isle of Man. All this required a good deal of capital and complex stage management: you had to hire a small theatre and set up your projection equipment, your sound-effects, get the publicity material printed, and produce your performances on time every time. In other words, these were proper stage performances.

These professionals took over from the poverty-stricken itinerant showmen who, with a lantern on their back, had travelled all over Europe and England during the previous century. Pictures of ghosts and devils were their bread-and-butter subjects and a man with a hurdy-gurdy provided the musical accompaniment. At least a show was good for a meal and a few coins. These so-called Galantie shows became a permanent fixture of London life at the end of the eighteenth century and the beginning of the nineteenth, specially around Christmas time.

I want to end this lecture by showing you some of the slides which these showmen might have used, in fact, these are so old that they may have once belonged to one of them. May I just mention that they are all hand-painted using varnish colours. To my mind, they have always been the essence of British folk-art of that time and I hope that, like me, you enjoy their glorious colours and their primitive directness and humour.

The next lecture will deal with the development of the lantern from about 1820, moving slides, the first mass-produced slides, and dissolving views.

BOOK REVIEWS

We present two views of Richard Balzer's recent book – one broadly *for* and the other decidedly *against*. This he appears to have published himself – and illustrated with photographs of items from his own collection – although, curiously, neither of these things is confirmed by the book itself.

Richard Balzer

OPTICAL AMUSEMENTS

Magic Lanterns and Other Transforming Images
A catalog of popular entertainments

[Boston, MA?]: [Author?], *c.*1987. 280x216mm, 81 pages

BOOK REVIEW : ONE

A GOOD PICTURE REFERENCE

R. G. MORRIS

This is a book catalogue to support the exhibition held at the Museum of Our National Heritage, Boston, USA, which was part of the Magic Lantern Society of the United States of America and Canada's Convention of June 1987. Richard Balzer is the current Chairman of the Society and has published this illustrated catalogue which shows a major part of his own private collection. In itself it is an interesting record of one man's collection and is a good picture reference book for collectors, giving many examples of American pre-cinema collectables that are not readily available in Great Britain and Europe. The quality of the colour is excellent, but some black and white illustrations are not up to the same standard. The book is in three main sections, the first forty pages are mainly illustrations of magic lanterns, accessories, slides and ephemera. The next section has nearly twenty pages illustrating many facets of Peepshows, Panoramas, and Dioramas. The last section of the book – titled 'Optical Illusions and Persistence of Vision' contains numerous illustrations of Thaumatropes, Phenakistoscopes, the Ludoscope (an American phenomenon) and others, finishing with 'flick-books'.

The inevitable mistitling of some plates is understandable, despite rigid checks and proof reading, it happens to all of us. The text, although sparse, supports the basic concepts of the illustrations and exhibition. The book includes a chronology of each section and a short general bibliography. The chronology of pre-cinema development and invention is a good quick reference list and ideal for the beginner, although a certain amount of *investing* takes place. Some inventors did invest in their own inventions but perhaps it is Dick's thinking every time he buys a new piece for this grand collection! The short bibliography is by no means new, but it does give another anagram for author C. W. Marec. Despite these minor criticisms this is an excellent addition to the library of every collector and researcher of magic lanterns and optical toys, although a paper-back, there were some hardback copies available.

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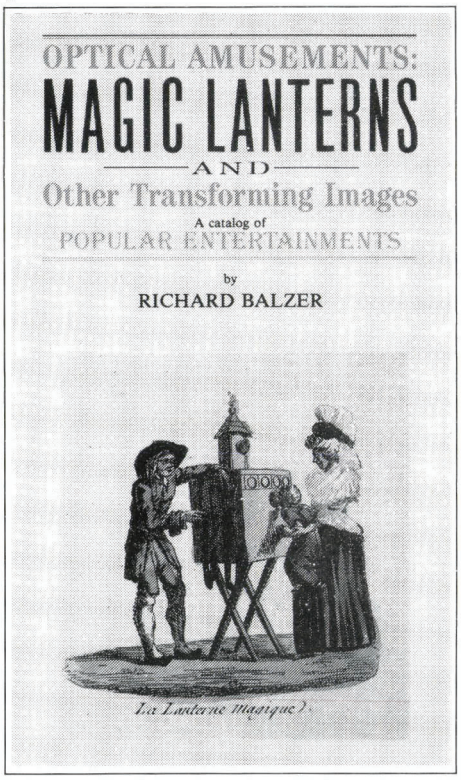

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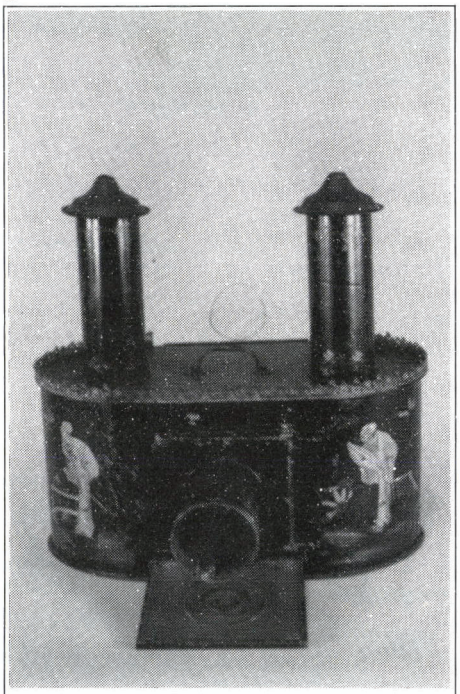

LAMPATORAMA LANTERNA MAGICA — Frankreich, Delagrave, Paris, 1882, hand-painted chinoiserie design, 11" high.