Intermezzo: Moving pictures

At the exact same time as Buontalenti and Aleòtti were creating a style of theatre that might be described metaphorically as 'cinematic', an experiment was being tried in Naples with a different type of dramatic entertainment that truly can be seen as the ancestor of the cinema.

In 1558 the Neapolitan 'professor of secrets' Giovanni Battista della Porta published a highly popular book called *Natural Magic,* which went into many editions and languages.[1] Natural or white magic is to be distinguished from occult or diabolical black magic: della Porta's book describes a whole series of phenomena and effects that might seem to the innocent observer to be miraculous, but which nevertheless can be accounted for by physical causes. For the 1589 edition della Porta added an extra section to his chapter 17, 'Of Strange Glasses'. This gave an account of a new type of show with which he had often amused his friends. The text here is from the 1658 translation into English:

> That in a dark Chamber by white sheets objected, one may see as clearly and perspicuously, as if they were before his eyes, Huntings, Banquets, Armies of Enemies, Plays, and all things else that one desireth. Let there be over against that Chamber, where you desire to represent these things, some spacious Plain, where the Sun can freely shine: Upon that you shall set Trees in Order, also Woods, Mountains, Rivers, and Animals, that are really so, or made by Art, of Wood, or some other matter. You must frame little children in them, as we use to bring them in when Comedies are Acted: and you must counterfeit Stags, Bores, Rhinocerets, Elephants, Lions, and what other creatures you please: Then by degrees they

must appear, as coming out of their dens, upon the Plain: The Hunter must come with his hunting Pole, Nets, Arrows, and other necessaries, that may represent hunting… Swords drawn will glitter at the hole, that they will make people almost afraid.[2]

Della Porta's friends were wholly delighted, and he found it difficult, when he revealed the secret, to persuade them that all was done by 'natural reasons, and reasons from the Opticks'.[3]

What were these 'reasons from the Opticks'? Della Porta explains that the show was produced with a camera obscura (Latin: 'dark chamber'). The camera obscura at this period was typically a blacked-out room, with a convex glass lens set in an aperture in a door or window shutter. An image of the scene outside was thrown onto a wall or screen opposite the lens. Figure A.1 shows the arrangement. In this most basic type of camera the image is upside down. The camera obscura was the forerunner of the photographic camera: in the nineteenth century modern photography was created by the addition of the light-sensitive plate, onto which the image was fixed.

The principle of the camera obscura was known in the ancient world and was described by Aristotle. Up until the sixteenth century cameras had pinholes, not lenses, and the images were very faint. Once equipped with a glass lens, however – say 10 centimetres in diameter – a camera could produce a large bright image of an outdoor sunlit scene. The image would of course be in full colour, and if anything in the scene moved, the image would move with it. Figure A.2 shows a portable booth camera illustrated by Athanasius Kircher in his
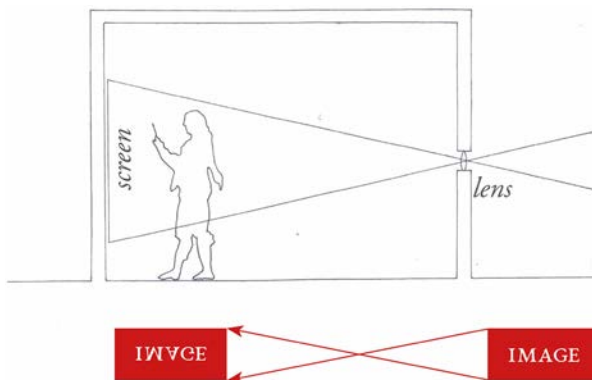
Figure A.1   Basic arrangement of a camera obscura, with a convex lens casting an image onto a wall opposite serving as a screen. As shown by the word IMAGE, the image created by the camera is both upside down and mirrored.
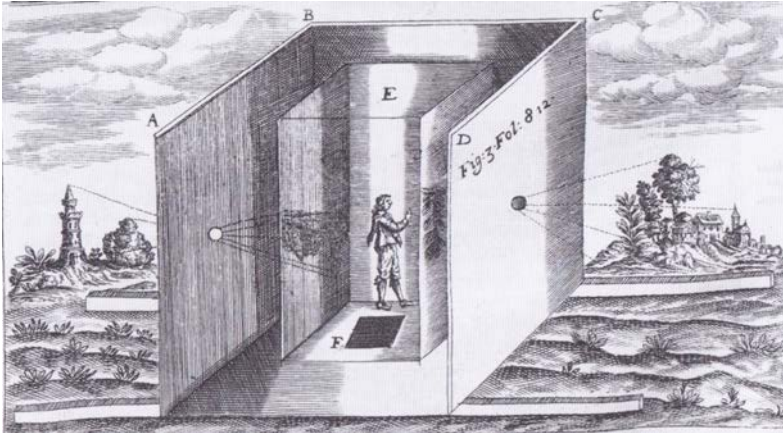
Figure A.2 Design for a portable booth camera obscura by Athanasius Kircher. The image is projected onto a translucent screen, which the artist studies from the back.

book *The Great Art of Light and Shadow*.[4] Here the image is projected onto a translucent screen made perhaps of oiled paper or thin cloth. An artist studies and traces this image from the opposite side of the screen.

Going back to della Porta: in order to create his entertainment, he must have turned a room in his house into a camera obscura. His child actors or puppets would then have performed outdoors against a background of painted or natural scenery, lit by the sun. Their moving images would have been cast onto some kind of screen. I have assisted at a recreation of della Porta's show in an English country house for a television programme. We blacked out a ground-floor drawing room and put a large convex lens into a window blind. Gentlemen in Tudor costume fought with glittering swords among the topiary in the garden outside. (The budget did not run to Rhinocerets.)

Figure A.3 shows a photograph of the scene projected onto the screen of our room-sized camera – in effect a 'still' from the 'film'.[5] Our camera was of the simplest type as in Figure A.1, and the images of the swordsmen were upside down. Perhaps della Porta had some optical means of righting his images. He mentions, albeit in vague terms, how this can be done either with concave mirrors and convex lenses in combination, or with plane mirrors angled at 45 degrees. In the eighteenth century, booth-type cameras became popular for drawing landscapes: these used mirrors, as described by della Porta, to turn the picture right way up. The optics expert Tim Jenison has recently

Figure A.3   Image obtained with a camera obscura of the type shown in Figure A.1 – hence the inversion of the image – built for a reconstruction of della Porta's optical theatre for a television programme. Focus is lost at the lower right because the aperture of the lens is large and the bushes are close to the lens. Della Porta might have arranged for the depth of his scene to be not so great, so that the image could all be in sharper focus.

recreated della Porta's camera 'cinema' using a flat mirror to rectify the image.[6]

The versatile Dutch engineer Cornelis Drebbel, writing in the early seventeenth century, described a show that was possibly another kind of camera obscura theatre. Drebbel's fame has been growing in recent years but is still not as great as it should be, for several reasons: he published little; he kept the secrets of many of his inventions, since they were his stock in trade; and he applied his advanced knowledge of physical principles and chemical processes to what were in many cases showpieces or marvels. He was nevertheless very much admired and celebrated in his lifetime. He worked in England for James I and

Charles I, and was attached for a time to the court of Rudolf II in Prague. Constantijn Huygens, Secretary to the Prince of Orange in Holland and father of the astronomer Christiaan Huygens, compared Drebbel to the great natural philosopher (and Chancellor of England) Francis Bacon, describing Drebbel as 'unequal in rank but not in talent'.[7]

In 1608 or 1609 Drebbel wrote to Ysbrandt van Rietwyck, an acquaintance in his hometown of Alkmaar.[8] In the letter Drebbel describes an entertainment in which he has the starring role:

> I take my stand in a room and obviously no one is with me. First I change the appearance of my clothing and in the eyes of all who see me. I am clad first in black velvet, and in a second, as fast as a man can think, I am clad in green velvet, in red velvet, changing myself into all the colours of the world. Nor is this all, for I can change my clothing so that I seem to be clad in satin of all colours, now cloth of gold, now cloth of silver; and I present myself as a king, adorned in diamonds, and all sorts of precious stones, and then in a moment become a beggar, all my clothes in rags …[9]

Drebbel could also become a 'tree with all my leaves fluttering as if in a breeze'. He could transform himself into a lion, a bear, a horse or a cow. He could create the illusion 'that the earth was opening and ghosts arising from it, first as a cloud and then in the forms of good spirits, such as Alexander the Great or another prince or king'.

Drebbel, true to form, offers no explanation of how this was done, and we have no accounts from anyone who saw the show. So maybe he is just 'windbagging' about all this, as the Dutch say. But he was at the very centre of optical research in the early seventeenth century, so it is possible, at least, that he could have put on a performance of this kind using some optical means.[10] He was known for his lenses, telescopes and microscopes. He was acquainted with the Middelburg spectacle-maker Zacharias Jansen and with Jacob Metius of Alkmaar, both of whom ground lenses. He made significant improvements to the design of microscopes – and he built camera obscuras.

It has been suggested that Drebbel might have put on his costume-changing show using either a camera or a magic lantern. Much later in the history of the lantern, there were indeed variety performances of exactly the kind that Drebbel describes. The American dancer Loïe Fuller became famous in the 1890s for her 'serpentine dances' in which plain colours or images of butterflies, birds or flowers were projected

with slides onto her floating diaphanous white dress. Fuller starred in this act at the Folies-Bergère and was so successful that she was able to build her own theatre.[11]

The year 1608 would have been very early for Drebbel to build a lantern, however. Historians generally agree that it was the Dutch mathematician and astronomer Christiaan Huygens, son of Constantijn, who devised the first true magic lantern in the late 1650s.[12] Might Drebbel have used a camera obscura for his entertainment? Jean-Noël Paquot, historian of the Netherlands, says that Drebbel 'made instruments by means of which were seen pictures and portraits; for instance he could show you kings, princes, nobles, although residing at that moment in foreign countries; and there was no paint or painter's work to be seen, so that you saw a picture in appearance, but not in reality'.[13] This strongly suggests a camera obscura arrangement in which Drebbel had pictures or actors outside the room. Might he have extended this principle to his garment-changing show?

This is entirely conjectural, but one can imagine that he could have had an assistant in a space adjoining the camera, brightly lit by the sun but in front of a black background. The position could have been marked on the ground at which this second person should stand in order to project an image inside the camera, coinciding in position and size with Drebbel's body. The assistant would have had suits of clothes of different colours ready to hand and could have stepped in and out of position to change (or there might have been several assistants ready dressed). He would be wearing a black mask. His clothes but not his face would thus have been projected onto Drebbel's body. If Drebbel's camera were of the simple type shown in Figure A.1, his assistant would have had to be upside down, which seems improbable. Maybe he had an optical means of rectifying the image. Tim Jenison has recreated Drebbel's show in another way, with a type of lens-less 'lantern', using a large convex mirror reflecting the sky as the source of illumination.[14] Slides – which do not then need to be inverted – can be introduced to cast colours or designs onto the performer's clothing. The results are impressive.

Drebbel says that he starts out with a black velvet costume. But if he had actually been dressed in white, this would have allowed different colours (including black) to be projected onto him. The trees, cows, ghosts and Alexander the Great could have been produced as in della Porta's theatre. This, however, is all supposition. By contrast, there are descriptions of some other seventeenth-century 'camera obscura theatres' by people who actually saw them.

In 1638 a Parisian member of the Order of Minims, Father Jean-François Niceron, published *Curious Perspective*, a book about a class of trick pictures known as anamorphic perspectives.[15] In the book Niceron has a short section on the camera obscura, in which he describes an entertainment in Paris that seems to have been technically comparable with della Porta's optical theatre, but whose character appears to have been altogether more dubious and disreputable.[16] This theatre was on the Pont Neuf near the pump house known as the Samaritaine. In the seventeenth century the bridge was always busy, the crowds entertained by all kinds of street performers: jugglers, magicians, fire-eaters and tumblers. There were quack doctors, tooth-pullers, pamphlet-sellers and pickpockets.

Niceron's account is a little confusing, and it is not easy to understand quite what went on inside what was presumably a small room with seats. He says: 'This kind of ravishing Perspective has sometimes so deceived the eyes of those in the chamber, that after having lost their purse, they see this in the hands of those who count and carry away their money in a wood or on a floor, thinking this representation is made by magic.'[17] The charlatan in charge of the show uses a whistle or other signal to alert accomplices who are seen on screen by the audience, picking pockets and counting their loot on the bridge outside. If this is indeed what happened, it raises the obvious question of why people would pay good money to watch themselves and others being robbed? One point on which Niceron is clear, however, is that there are several ways of righting the inverted images in a camera 'either by means of convex spectacle lenses, or with a mirror, and also to make them larger, to make them life size'.[18]

In 1656 the French writer Jean Loret described (in verse) what sounds like another camera obscura theatre, again in Paris, but at the opposite end of the social spectrum.[19] This was at the Hôtel de Liancourt where Loret and his companion Madame de Choisy saw beautiful palaces, ballet dancers and swordsmen with flashing rapiers, appearing on a large white cloth. The dancers and swordsmen moved *with their feet in the air*.

Finally, there is an optical show described by the great natural philosopher Robert Hooke, curator of experiments to the Royal Society in London, in a paper dated 1668.[20] There is no question about the optics this time: Hooke is definitely describing a camera. He says that one must make a hole in the wall opposite where the image is to appear, and place in it a convex lens such that 'it may represent the Object distinct on the said place'. The object or objects outside must be well lit by reflecting

either the sun onto them in the day, or the light from torches or lamps at night, using mirrors. Alternatively, a transparent picture can be lit from behind. The objects are to be set upside down, so that their images are the right way up. However, 'If the Object cannot be inverted, as 'tis pretty difficult to do with Living Animals, Candles &c', then a rectified image can be produced with a combination of two lenses.

This was not just a theoretical idea of Hooke's. Henry Oldenburg, publisher of the Royal Society's *Transactions*, adds in a note that he had been present at shows of this kind given by Hooke to the Society 'some years since'. Hooke says that his experiment 'hath not, that I know, been ever made by any other person this way'.[21] But we know that della Porta had anticipated Hooke by more than a century. Maybe Hooke had just been reading the English edition of della Porta's *Natural Magic,* which was published in 1658.

Why would people trouble or even pay to see a projected image, indoors, when they could stay outside and look at the real thing? On the face of it, this is odd. There are several reasons, I would suggest. It is worth reiterating that these camera obscura theatres would have showed mobile images in fine detail and full colour, which would have been even more impressive to their inexperienced audiences than were the first (black and white) movies in the late nineteenth century, especially if the actual players and sets were kept secret and out of sight.

The camera obscura image remains somehow magical even to us today who are so familiar with photographs and films. Seen in the semi-darkness, the colours give the impression of being more concentrated and luminous than in direct vision. Part of the fascination is that, even in a largely static landscape, there are small details that move: clouds drift in the sky, leaves flutter in the wind, birds wheel across the screen. This is why large camera obscuras at the tops of towers or at seaside resorts, projecting all-round panoramas, became popular in the nineteenth century, and remain so today.

Even so, judging by the paucity of descriptions, there can have been only a few of these 'proto-cinemas' actually built and exhibited in the sixteenth and seventeenth centuries. Huygens's magic lantern offered a comparable form of optical entertainment that proved much more successful. This was probably because the lantern was more versatile, it did not require actors, sets and sunshine as the camera obscura theatre did, and its subject matter was limited only by the slide painter's imagination and skill. Athanasius Kircher put on lantern shows in Rome (Figure A.4), and even hinted that he was the instrument's inventor.[22]
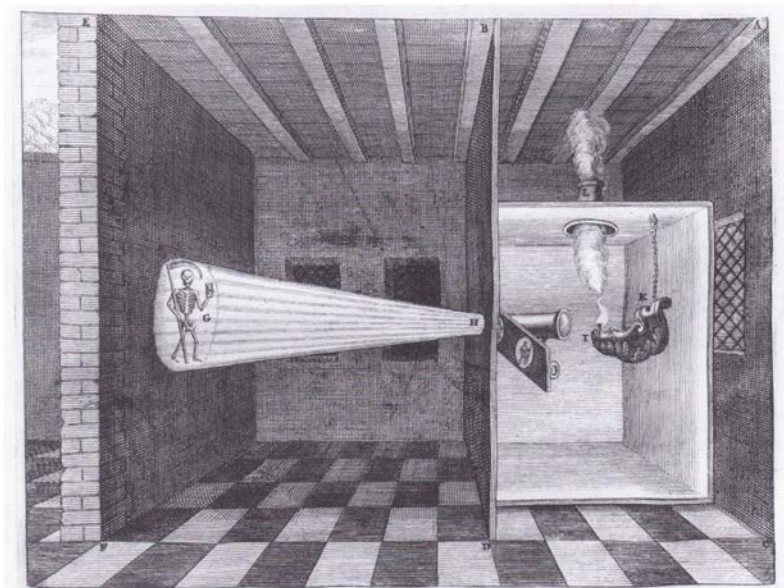
Figure A.4 A magic lantern illustrated by Athanasius Kircher in *The Great Art of Light and Shadow*, projecting an image of Death.

Right at the start of the lantern's development there were mechanisms devised by which the images on the screen could be given simple movements. Huygens himself published sketches for mobile slides showing a jaunty skeleton in several positions, taking off his own skull and examining it like Hamlet's gravedigger and poor Yorick (Figure A.5).[23] Kircher's slides featured Death with his scythe and damned souls burning in Hell. This association of the magic lantern with the diabolical and the spooky was to persist until the late nineteenth century.

The reasons were doubtless connected with the technical practicalities of early lanterns. Because the available light sources were weak, the shows had to be held at night or in curtained rooms. Candles and oil lamps gave a flickering, uneven light, and the projected images must have had a ghostly, insubstantial quality, while the focus would not have been completely sharp. The lantern was thus intrinsically suited to creating spectral visions. Like ghosts, these projections could be made to appear from nowhere, change size and disappear again just as abruptly. Paradoxically, the unreal could be represented more convincingly than the real. These were the dark reasons why the lantern was 'magic'.
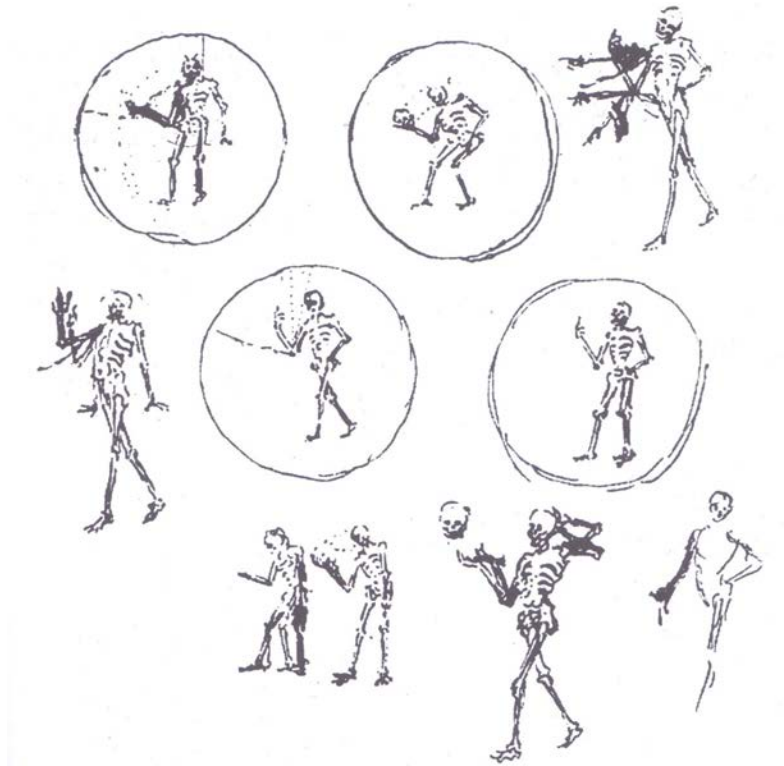
Figure A.5 Sketches made by Christiaan Huygens in 1659 for an animated lantern slide, showing a skeleton removing its own head.

Notes

1   Giovanni Battista della Porta, *Magia Naturalis*, 4 vols (Naples: 1558). A second edition was published in 1589 in 20 volumes, and many editions in other languages including English followed.

2   *Natural Magick by John Baptista Porta, a Neapolitane*, trans. Thomas Young and Samuel Speed (London: 1658), pp. 364–5.

3   *Natural Magick*, p. 365.

4   Athanasius Kircher, *Ars Magna Lucis et Umbrae* (Rome: 1646), p. 709, plate 28. Kircher had seen this design of camera in Germany. The figure shows *two* similar cameras back to back. What the purpose of this might be is unclear, unless it is a device of the illustrator to show the same set-up from two different angles.

5   'Seeying the worlde' in TV series *What the Tudors Did for Us*, BBC (2000).

6   Tim Jenison, personal communication.

7   A. G. H. Bachrach, 'The Role of the Huygens family in Seventeenth-Century Dutch Culture', in H. J. M. Bos, M. J. S. Rudwick, H. A. M. Sneiders and R. P. W. Visser (eds), *Studies on Christiaan Huygens* (Lisse: Swets and Zeitlinger, 1980), p. 37.

8   In Ms. Constantijn Huygens – bundel XLVII der Koninklijke Nederlandse Akademie van Wetenschappen, folio 207 r–v.

9   Translation by Rosalie Colie in 'Cornelis Drebbel and Salomon de Caus: Two Jacobean Models for Salomon's House', *Huntington Library Quarterly*, 18, 3 (May 1955): 245–60; see p. 254.

10 Biographies of Drebbel include L. E. Harris, *The Two Netherlanders: Humphrey Bradley and Cornelis Drebbel* (Cambridge: W. Heffer and Sons, 1961), and Gerrit Tierie, *Cornelis Drebbel (1572–1633)* (Amsterdam: H. J. Paris, 1932).

11 See entry on 'Loïe Fuller' in David Robinson, Stephen Herbert and Richard Crangle (eds), *Encyclopaedia of the Magic Lantern* (London: The Magic Lantern Society, 2001), pp. 118–19.

12 Willem Albert Wagenaar, Lodewijk Wagenaar and Margreet Wagenaar-Fischer, 'The True Inventor of the Magic Lantern: Kircher, Walgenstein or Huygens?', *Janus*, 66 (1979): 193–207.

13 Jean-Noël Paquot, *Histoire Littéraire des Pays-Bas* (Louvain: 1765–70), quoted in translation by William Brenchley Rye, *England as Seen by Foreigners in the Days of Elizabeth and James the First* (London: John Russell Smith, 1865), p. 234.

14 Tim Jenison, personal communication. The slide images are very bright and always in focus, and can be made larger or smaller by moving the slides towards or away from the target. But there is no documentary evidence that Drebbel worked this way.

15 Jean-François Niceron, *La Perspective Curieuse ou magie artificielle des effets merveilleux* (Paris: Billaine, 1638). Niceron later published an extended version in Latin, *Thaumaturgus opticus, seu Admiranda optices per radium directum, catoptrices per radium reflectum* (Paris: Langlois, 1646).

16 Jean-François Niceron, *La Perspective Curieuse*, 2nd edn in 4 vols (Chartres and Paris: 1652), vol. 1, p. 22.

17 Niceron, *La Perspective Curieuse*, vol. 1, p. 22. My translation.

18 Niceron, *La Perspective Curieuse*, vol. 1, p. 23. My translation.

19 Jean Loret, *La Muze Historique ou Receuil des Lettres en Vers* (Paris [?]: Daffis, 1877), vol. 2 (1655–8), Letter 19, 13 May 1656.

20 Robert Hooke, 'A Contrivance to Make the Picture of Any Thing Appear on a Wall, Cubboard, or Within a Picture-frame &c', *Philosophical Transactions*, 38 (Monday 17 August 1668): 741–3.

21 Robert Hooke, 'A Contrivance', p. 741.

22 Kircher, *Ars Magna Lucis et Umbrae*, 2nd edn (Amsterdam: 1671).

23 See Laurent Mannoni, *The Great Art of Light and Shadow: Archaeology of the Cinema* (Exeter: University of Exeter Press, 2000), pp. 38–9.