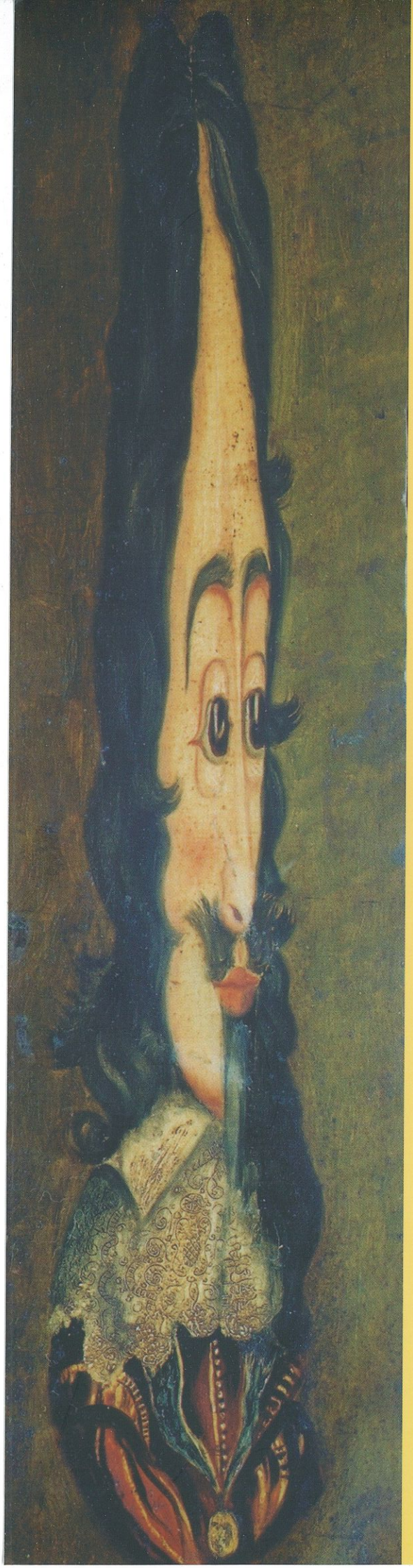

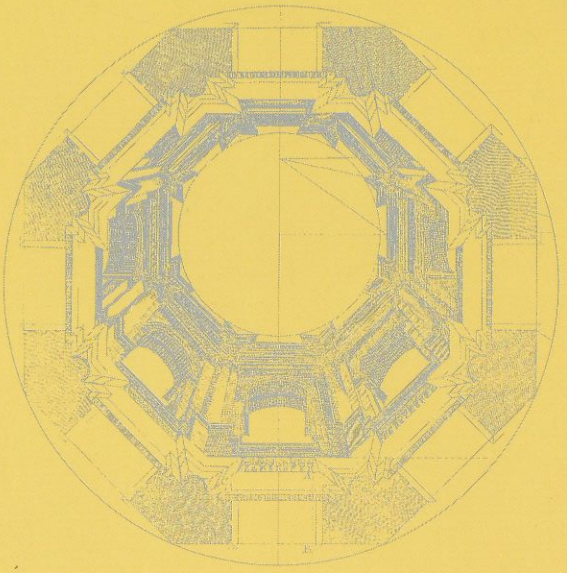

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BAROCK-BERICHTE

Deac Rossell

The Magic Lantern and Moving Images before 1800

In early July 1672, the Parisian medical doctor and antiquarian Charles Patin visited Nuremberg and saw a magic lantern show. Patin had fled Paris in 1667 when a satirical pamphlet about the new mistress of King Louis XIV, Mme. de Montespan, was discovered by the French authorities in a package of books he had smuggled into Paris from The Netherlands. Fleeing the country before he was sentenced *in absentia* in February 1668 to lifelong service in the galleys of the French Navy, Patin spent the years 1667 through 1672 travelling across Europe visiting noble courts and learned scientists, collecting medals and coins, and searching out the most interesting rarities and amusing curiosities. Before settling in Basel his travels took him from Vienna to Hungary and Bohemia, across Bavaria and down the Rhine to Mainz and Cologne, from Berlin to Jena, Leipzig, Dresden and Salzburg.[1] His host in Nuremberg was a friend of his father's, Johann Georg Volckamer the elder, who kept up an international correspondence as president of the *Leopoldina* and who was a leading figure in the city's intellectual and cultural life. Patin examined his host's large collection of antique coins and medals, saw the impressive group of weapons and paintings gathered by Johann Andreas Viatis, and spent some time browsing in the library of rare medical and philosophical books owned by the apothecary Johann Leonhard Stöberlein. "There are many Learned men in this City; Antiquity, History, Politicks, Eloquence, and the Mechanical Arts are there in flourishing State," Patin wrote in *Quatre Relations historiques*,[2] a series of four letters on his travels that were first published in 1673 (*fig. 3*). It was Volckamer who recommended the magic lantern show to Patin, a show produced by a recent addition to Nuremberg society: a former Capuchin monk who converted to the Lutheran confession and was now an optical instrument dealer and manufacturer named Johann Franz Griendel. Patin was most impressed by Griendel and his exhibition, calling him "absolutely Master of the most abstruse Secrets in Opticks" and saying that "there never was in the World a greater Magitian than he."[3] Patin's description of Griendel's magic lantern show is the most extensive surviving account of a 17th century magic lantern presentation. "For it seem'd to me as if I had a sight of Paradise," wrote Patin, "of Hell and of wand'ring Spirits and Phantoms, so that altho' I know myself to be endu'd with some measure of Resoluteness, yet at that time I wol'd wilingly have given one half to save the other: All thes Appiritions suddenly disappear'd and gave place to Shews of another nature: For in a moment I saw the Air fill'd with all sorts of Birds, almost after the same manner as they are usually painted round about Orpheus, and in the twinkling of an Eye, a Country-Wedding appear'd to my view, with so natural and lively a representation that I imagin'd myself to be one of the Guests at the Solemnity. Afterward the Horizon of my sight was taken up with a Palace so stately, that nothing like it can be produc'd, but in the Imagination; before which there were divers Personages running at the Ring: these Heroes seemed to be the Gods that were adored by Antiquity, and among them 'twas pleasant to observe Momus mounted upon a Barbary-Horse, and making Satyrical Reflections upon Jupiter, who had made a false step amidst so jolly a company."[4]

fig. 1: Showman with magic lantern, porcelain, Germany (Meissen) c. 1800

Patin's report of this exhibition is interesting in several respects, but perhaps the most mysterious aspect of Griendel's show centres on whether or not he was exhibiting mechanical moving slides. Was the magic lantern a new optical instrument which not only magnified images and allowed its operator to show stately palaces or country weddings at will, to represent the Roman gods and courtly sports, but which also for the first time had found a way to imperceptibly change the image while it was being shown, and actually represent the movement of people and animals? Patin's language here is suggestive but inconclusive. He describes the game of "running at the ring", where horsemen attempted to catch a hanging leather ring on their short lances; he describes "the Air fill'd with all sorts of Birds"; he describes a country wedding in a representation both "natural and lively." But as with all new devices, whether technological or showmanly, the appearance of something new in the world makes great strain on the capacities of language to find the vocabulary to properly describe previously unknown effects. So the automobile was at first a "horseless carriage" and the telephone a "speaking telegraph."

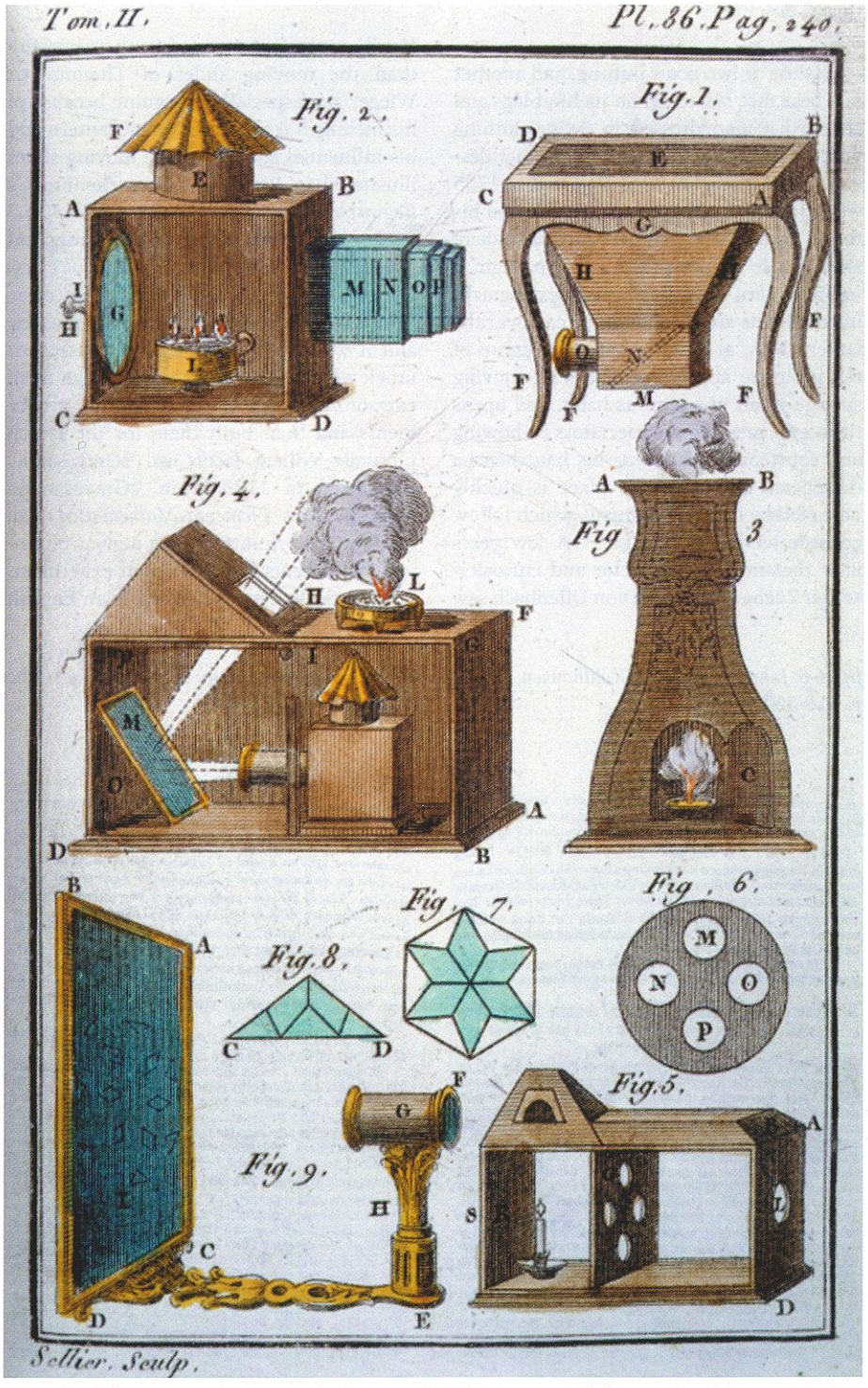
In the case of Griendel's magic lantern show, the presence of moving images is supported by the precedent that the idea of moving images was proposed as soon as the optical arrangement of a projecting lantern was known. The first documented appearance of the magic lantern comes in the correspondence of the Dutch scientist Christiaan Huygens. His father asked him to make a lantern in spring 1662, and a French colleague wrote to him two years later ask-

ing about the arrangement of lenses in the new projecting apparatus.[5] But the first indication of Huygens's awareness of the magic lantern is found in a remarkable series of ten small drawings of a dancing skeleton that he made in 1659. Huygens noted that these drawings were intended for "representations by convex glasses in a lantern."[6] In the Huygens drawings, the skeleton is variously shown moving its right arm, removing its skull from its shoulders, and tossing a skull into the air. Apart from Huygens's own fascination with dancing skeletons – he had painted much enlarged figures from Hans Holbein's *Dance of Death* on his garden wall in 1646 – his awareness of the ability of the magic lantern to reproduce movement is a recognition that he saw the lantern as much more than an instrument that could vividly illustrate the laws of optics. Although for the next hundred years the magic lantern was dutifully included in books describing experimental science, where it served as a means of demonstrating how images are formed and enlarged through the refractive power of lenses,[7] Huygens understood from the beginning that the lantern had the parallel ability to exhibit motion and therefore to participate in the dynamic world that had been constructed by Baroque painters, architects and musicians. For Huygens, the lantern was never an instrument of observation, like the microscope or the astronomical telescope, or an instrument of measurement, like the barometer or the pendulum clock. It was not even a demonstration instrument like the air pump. Instead, what the lantern represented to this somewhat dour scientist was an instrument of reproduction, an instrument that would show things at the will of its operator, but one that had the special ability to show painted images that moved.

Just a generation younger than Huygens, the mathematician, scientist and diplomat Gottfried Wilhelm Leibniz saw the magic lantern in 1675 as an essential element in his proposal for an extravagant celebration of universal industry and the arts. The lantern would open his proposed entertainments, and would give particularly dynamic performances at his Baroque temple of human progress, since it could "represent quite extraordinary and grotesque movements, which men would not be capable of making." The lantern would also conclude his shows, and again it is motion and movement which particularly captivates Leibniz, as he combined the magic lantern with a new type of marionette theatre "in which there were light and small wooden moving figures, which would throw their shadow onto a transparent paper sheet, behind which there would also be light; this would cause the shadows to appear on the paper in a highly dazzling manner, and enlarged." Moving back and forth in perspective, increasing and decreasing in size, all the lights would then be extinguished except one: "This remaining light with the aid of a magic lantern would throw against the wall admirably beautiful, and movable, figures, which would maintain the same laws of perspective. This would be accompanied by a song from behind the theatre. The small figures would be moved from below or by their feet, such that those who were moving them would not appear. Singing and music would accompany everything."[8]

Notwithstanding the elaborately imagined entertainments of Leibniz, descriptive evidence of early moving slides for the magic lantern exists only at a more prosaic level. Indeed, Huygens's dancing skeleton and the delights of Griendel's lantern show both seem to surpass eyewitness accounts of moving slides until the middle of the 18th century. About 1697 Erhard Wiegel projec-

fig. 2: Edme-Gilles Guyot, Nouvelles Récréations Physiques et Mathématiques, Paris 1800 plate 86, Fig. 4



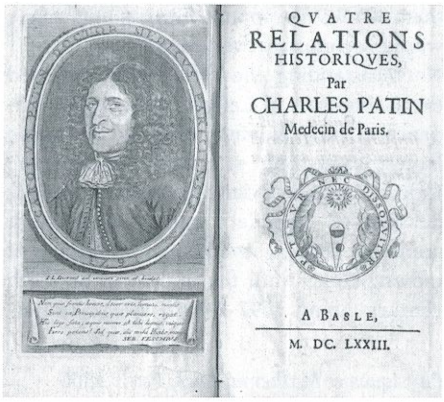


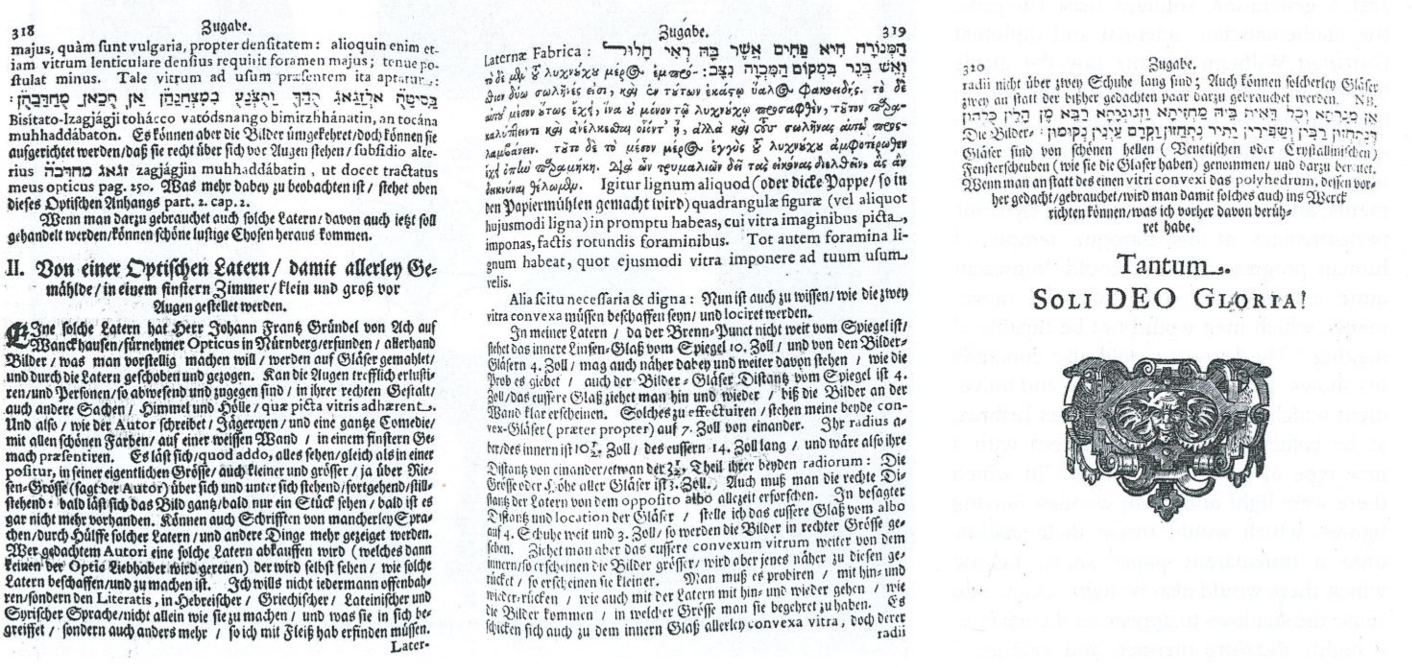
fig. 3: Charles Patin, Quatres Relations historiques, Basel 1673

ted a slide of two goats butting, and another of a bear that reared up on its hind legs and attacked a man dressed in Swiss clothing with its front paws.[9] A more elaborate description of a moving slide appeared in 1705 when Johann Conrad Creiling published his thesis *Phaenomena Laternae Magicae*, where an example of the proper way to begin a magic lantern show begins with extinguishing the lights and removing the cap over the lantern lens, at which point "the figure of the prologue appears on the wall, moving strangely and in a curious habit, and opens the scene, greeting the spectators by bowing and courteously removing his hat; then he disappears again and his place is quickly occupied by other movements which follow consecutively one by one."[10] A few years later the travelling collector and curiosity-seeker Zacharias Conrad von Uffenbach saw some moving slides made by an optician and glass grinder named Themme whose premises were near the Zwirin Gate in Kassel. From his visit of 19 November 1709 von Uffenbach described slides of a moving carriage with rotating wheels made of brass and moved by a thread, a Cherub working at a spinning wheel, also moved by a thread, and a shooting gun, which was worked by a rapidly withdrawn paper slip that revealed the reddish firing discharge and speeding bullet.[11] Von Uffenbach was not especially impressed with Themme's work, calling it a mediocre invention, but before he left Kassel he spent ten florins at Themme's shop to purchase seven of his moving slides.[12]

Hardly more sophisticated in their imagery than the moving slides of Themme or Wiegel, but especially intriguing because of his lifelong interest in the magic lantern and his influential family, are five moving slides illustrated in Petrus van Musschenbroek's *Beginselen der natuurkunde...* of 1736.[13] Professor of Medicine at Duisburg, of Natural Philosophy at Utrecht, and of Physics at Leiden, van Musschenbroek came from a famous family of instrument makers, and it was his brother Jan van Musschenbroek who collaborated on the design of an extraordinary group of scientific instruments and then built them for the Dutch physicist Willem Jacob van 'sGravesande. Publicized in 1720-21 in 'sGravesande's book *Physices Elementa Mathematica*,[14] an influential work introducing new or improved instruments for Newtonian experimental science that was published in an English edition in London the same year and was popular across Europe for the rest of the 18th century, Jan van Musschenbroek's set of instruments included an excellent magic lantern with superior lenses and a unique diaphragm, or stop, in its lens tube to block the inevitable stray rays of light reflecting from its lenses, with the result that the image reaching the screen when the lantern was in use was brighter and more finely detailed than in any previous instrument.

It has long been assumed that the moving slides that Petrus illustrated in his physics textbook simply came from the family workshop, where he indicated that they could be bought. A catalogue of instruments available at the family workshop was invariably bound at the end of the book. But it now seems that these five moving slides are probably the work of Petrus himself. Until he left home in 1714 on his studies, Petrus spent much of his time in the workshop painting and making lantern slides. In early 1711, von Uffenbach also visited the Musschenbroek workshop, and had already bought a magic lantern from the family; he complained about the work of Petrus in making slides: "We hear that the youngest brother makes the figures for it [the magic lantern]. But they are not as faultless as those the father had made."[15] Petrus also seems to have made his own magic lantern especially for moving slides, which was sold at auction in 1794. There would seem to be no reason why he should need to make his own lantern when his brother Jan was turning out a lantern that was unequi-

fig. 4-6: Johann Christoph Kohlhansen; description of the magic lantern, in: Neuerfundene Mathematische und Optische Curiositäten, Coburg 1677, p. 318-320.


318 Zugabe.

majus, quàm ſunt vulgaria, propter denſitatem: alioquin enim etiam vitrum lenticulare denſius requirit foramen majus; tenue poſtulat minus. Tale vitrum ad uſum præſentem ita aptatur: בסיטה אלזגאג׳ תהך ותצבע במצחנתן אן תכאן מחדבתן: Bisitato-Izagjágji tohácco vatódsnango bimirzhhánatin, an tocána muhhaddábaton. Es können aber die Bilder umgekehret/doch können ſie aufgerichtet werden/daß ſie recht über ſich vor Augen ſtehen/ ſubſidio alterius מחרבה זגאג׳ zagjágjin muhhaddábatin, ut docet tractatus meus opticus pag. 250. Was mehr dabey zu beobachten iſt/ ſtehet oben dieſes Optiſchen Anhangs part. 2. cap. 2.

Wenn man darzu gebrauchet auch ſolche Latern/ davon auch ietzt ſoll gehandelt werden/können ſchöne luſtige Choſen heraus kommen.

II. Von einer Optiſchen Latern/ damit allerley Gemählde/ in einem finſtern Zimmer/ klein und groß vor Augen geſtellet werden.

EIne ſolche Latern hat Herr Johann Frantz Gründel von Ach auf Wanckhauſen/fürnehmer Opticus in Nürnberg/erfunden/ allerhand Bilder/ was man vorſtellig machen will/ werden auf Gläſer gemahlet/ und durch die Latern geſchoben und gezogen. Kan die Augen trefflich erluſtiren/und Perſonen/ſo abweſend und zugegen ſind/ in ihrer rechten Geſtalt/ auch andere Sachen/ Himmel und Hölle/ quæ picta vitris adhærent. Und alſo/ wie der Autor ſchreibet/ Jägereyen/ und eine gantze Comedie/ mit allen ſchönen Farben/ auf einer weiſſen Wand/ in einem finſtern Gemach præſentiren. Es läſt ſich/quod addo, alles ſehen/gleich als in einer poſitur, in ſeiner eigentlichen Gröſſe/ auch kleiner und gröſſer/ ja über Rieſen-Gröſſe (ſagt der Autor) über ſich und unter ſich ſtehend/fortgehend/ſtillſtehend: bald läſt ſich das Bild gantz/bald nur ein Stück ſehen/ bald iſt es gar nicht mehr vorhanden. Können auch Schrifften von mancherley Sprachen/durch Hülffe ſolcher Latern/und andere Dinge mehr gezeiget werden. Wer gedachtem Autori eine ſolche Latern abkauffen wird (welches dann keinen der Optic Liebhaber wird gereuen) der wird ſelbſt ſehen/ wie ſolche Latern beſchaffen/und zu machen iſt. Ich wills nicht iedermann offenbahren/ſondern den Literatis, in Hebreiſcher/ Griechiſcher/ Lateiniſcher und Syriſcher Sprache/nicht allein wie ſie zu machen/ und was ſie in ſich begreiffet/ ſondern auch anders mehr/ ſo ich mit Fleiß hab erfinden müſſen.

Later-

Zugabe. 319

Laternæ Fabrica: המנורה היא פחים אשר בה ראי חלול ואש בנר במקום המכוה נצב׃ τὸ δὲ μὲν τοῦ λυχνούχου μέρος ἐμπρόσθεν δύω σωλῆνές εἰσι, καὶ ἐν τούτων ἑκάστῳ ὕαλος φανερός. τὸ δὲ αὐτοῦ μέσον οὕτως ἔχει, ἵνα οὐ μόνον τῷ λυχνούχῳ προσαφθῆν, τοῦτον παρακαλύπτειν καὶ ἀνέλκεσθαι οἷόν τ' ᾖ, ἀλλὰ καὶ σὺν σωλῆνας αὐτοῦ προσλαμβάνειν. τοῦτο δὲ τὸ μέσον μέρος ἐγγὺς τοῦ λυχνούχου ἀμφοτέρωθεν ἔχει ὀπὴν παραμήκη. Διὰ ὧν τρυμαλιῶν δεῖ τὰς εἰκόνας διελθεῖν, ἃς ἂν δεικνύναι θέλωμεν. Igitur lignum aliquod (oder dicke Pappe/ ſo in den Papiermühlen gemacht wird) quadrangulæ figuræ (vel aliquot hujusmodi ligna) in promptu habeas, cui vitra imaginibus picta imponas, factis rotundis foraminibus. Tot autem foramina lignum habeat, quot ejusmodi vitra imponere ad tuum uſum velis.

Alia ſcitu neceſſaria & digna: Nun iſt auch zu wiſſen/ wie die zwey vitra convexa müſſen beſchaffen ſeyn/ und lociret werden.

In meiner Latern/ da der Brenn-Punct nicht weit vom Spiegel iſt/ ſtehet das innere Linſen-Glaß vom Spiegel 10. Zoll/ und von den Bilder-Gläſern 4. Zoll/ mag auch näher dabey und weiter davon ſtehen/ wie die Prob es giebet/ auch der Bilder-Gläſer Diſtantz vom Spiegel iſt 4. Zoll/das euſſere Glaß ziehet man hin und wieder/ biß die Bilder an der Wand klar erſcheinen. Solches zu effectuiren/ſtehen meine beyde convex-Gläſer (præter propter) auf 7. Zoll von einander. Ihr radius aber/des innern iſt $10\frac{1}{2}$. Zoll/ des euſſern 14. Zoll lang/ und wäre alſo ihre Diſtantz von einander/etwan der $3\frac{1}{2}$. Theil ihrer beyden radiorum: Die Gröſſe oder Höhe aller Gläſer iſt 3. Zoll.) Auch muß man die rechte Diſtantz der Latern von dem oppoſito albo allezeit erforſchen. In beſagter Diſtantz und location der Gläſer/ ſtelle ich das euſſere Glaß vom albo auf 4. Schuhe weit und 3. Zoll/ ſo werden die Bilder in rechter Gröſſe geſehen. Ziehet man aber das euſſere convexum vitrum weiter von dem innern/ſo erſcheinen die Bilder gröſſer/ wird aber jenes näher zu dieſen gerücket/ ſo erſcheinen ſie kleiner. Man muß es probiren/ mit hin- und wieder-rücken/ wie auch mit der Latern mit hin- und wieder gehen/ wie die Bilder kommen/ in welcher Gröſſe man ſie begehret zu haben. Es ſchicken ſich auch zu dem innern Glaß allerley convexa vitra, doch derer

radii

320 Zugabe.

radii nicht über zwey Schuhe lang ſind; Auch können ſolcherley Gläſer zwey an ſtatt der bißher gedachten paar darzu gebrauchet werden. NB. אן מנרתא וכל דאית ביה מחזיתא וזגוגיתא רבא מן הלין כרהון דמתחזון רברבין ושפירין יתיר נתחזון וקדם עינין נקומון: Die Bilder-Gläſer ſind von ſchönen hellen (Venetiſchen oder Cryſtalliniſchen) Fenſterſcheuben (wie ſie die Glaſer haben) genommen/ und darzu bereitet. Wenn man an ſtatt des einen vitri convexi das polyhedrum, deſſen vorher gedacht/gebrauchet/wird man damit ſolches auch ins Werck richten können/was ich vorher davon berühret habe.

Tantum.

SOLI DEO GLORIA!

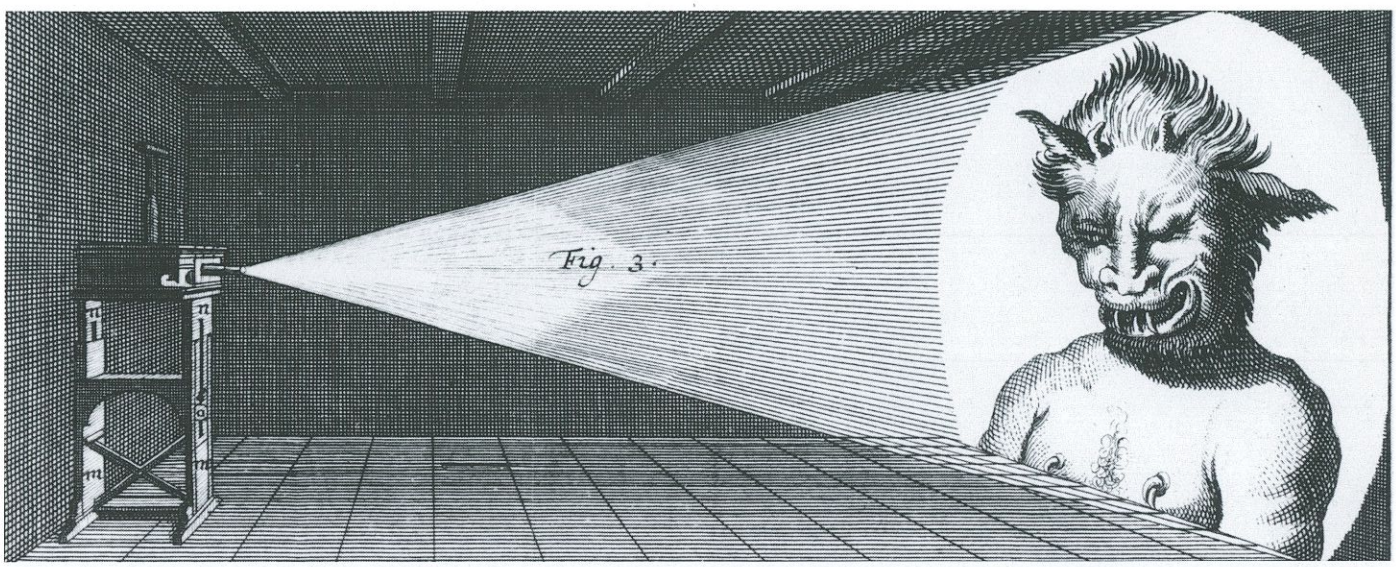
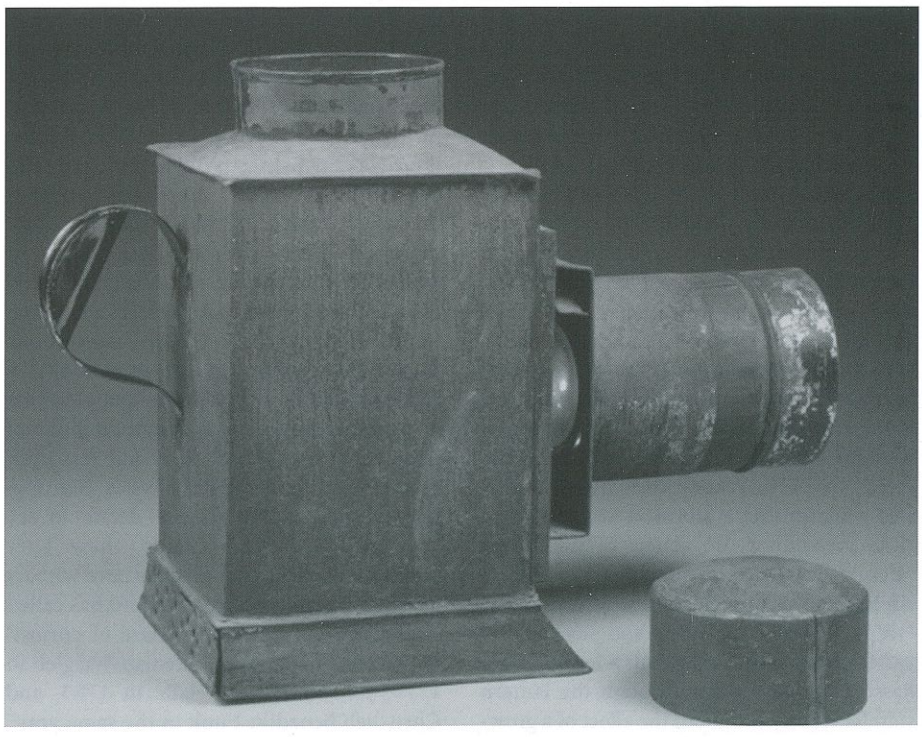


fig. 7: Willem Jakob 'sGravesande, Physices Elementa Mathematica, Geneva 1748, plate 109, detail

vocally the finest being made anywhere in Europe, a design copied by many other makers from Georg Friedrich Brander in Augsburg to Abbé Nollet in Paris, from around 1721 onwards. Petrus himself ordered one of the 'sGravesande lanterns made by his brother for the physics cabinet at Utrecht University. The only logical reason for Petrus to have built his own lantern for moving slides is that the slides that he built were not of a proper size to be used in either of the two standard sizes of 'sGravesande's design available from the family business. And that Petrus wanted to continue to use these slides, and perhaps others, without re-building and re-painting them to fit a new model lantern. The very strong implication then remains that Petrus must have built his lantern, and made his slides, before the 'sGravesande lanterns were ready beginning around 1720. Two of the slides, the "working mill" and the "lady making a curtsey" are certainly included in a Musschenbroek catalogue dating before the publication of *Beginselen der natuurkunde*.[16] An even earlier dating would certainly fit with his active time at the workshop before 1714, and his known involvement in painting lantern slides for the family business.

Although Petrus van Musschenbroek published detailed illustrations of a set of moving slides, he did not publish any account of their use or the context in which they were seen. So there is no way to determine whether the moving slides were linked with a series of other images and whether the motion they imparted on the screen came as the climax of a narrative, or whether they were used individually as a punctuation of movement that was separate from other projected images. In the nineteenth century with the sophisticated evolution of showmanly lantern techniques, both were possible. One thing that is certain, is that Musschenbroek's slide of the turning sails of a windmill was an image that would remain an essential part of the lantern showman's repertoire for the next 150 years or more, with additional effects like swans feeding in the millpond added after the discovery of dissolving views in the 1840s. The other four slides also became part of the standard lantern repertoire; they depicted a man drinking from a goblet, a man whose hat and wig can be removed or replaced at will, a tightrope walker moving with his balance pole from end to end of his rope, and a finely dressed lady who makes a polite curtsey. These five slides were not necessarily representative of Petrus's entire range of imagery[17] since they were selected for publication because they represented different ways of mechanically producing movement. Each slide uses two painted glasses, one of which is moved by various means. The sails of the windmill rotate continuously by means of a thread wound around an adjacent wheel with a crank, the drinking man's arm is rocked by a lever, the hat and wig are individually moved by two drawbars, the tightrope walker is slid

fig. 8: Laterna Magica, Holland before 1800



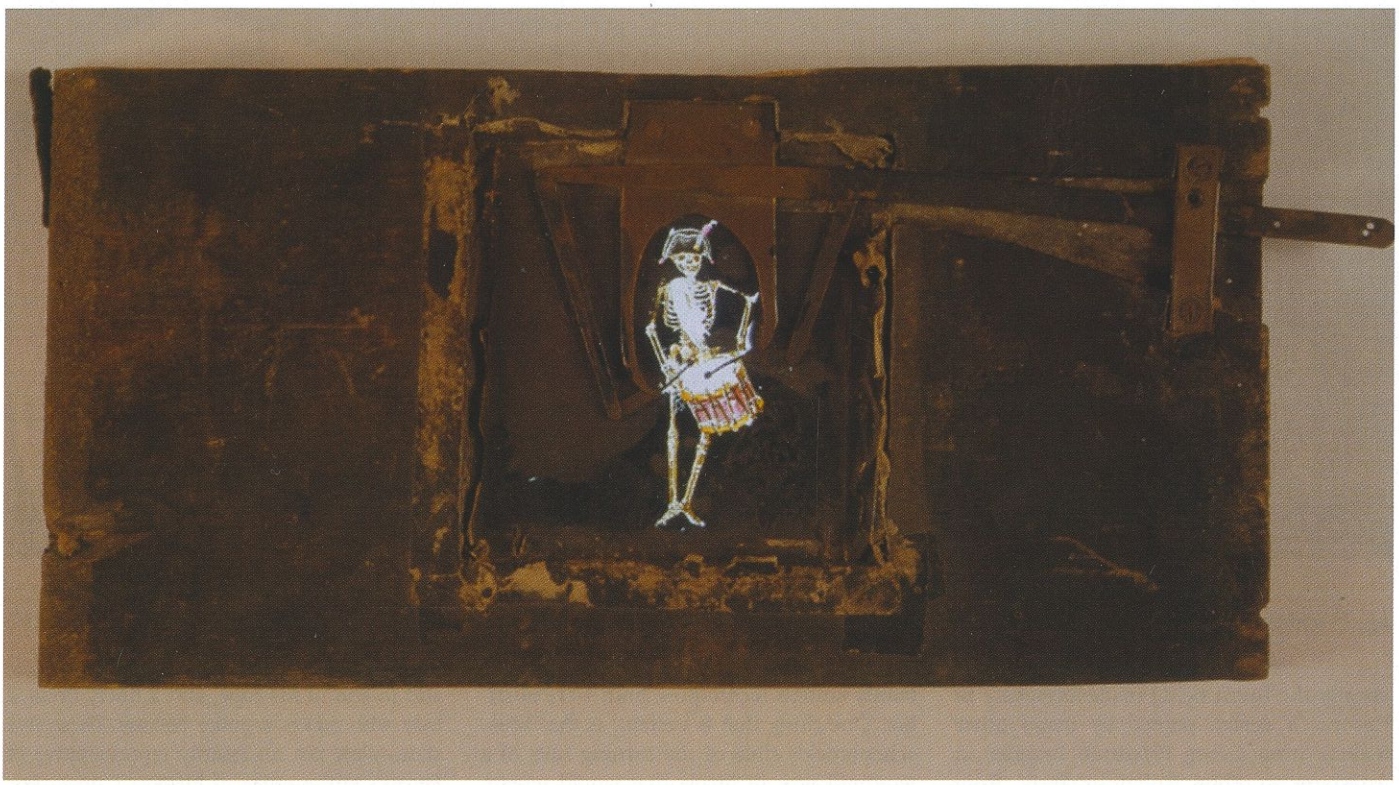


fig. 9: Skeleton beating the drum; mechanical lantern slide for the Phantasmagoria lantern, France c. 1800

across a panoramic background by a stout handle, and the woman making a curtsey has its glass hinged at the sides and is moved vertically up and down by a lever underneath. Abbé Jean-Antoine Nollet, physics teacher to the children of Louis XV, and an astonishingly successful public lecturer from 1735, paid a visit to the Musschenbroek workshop in 1736 and saw moving lantern slides, apart from the ubiquitous windmill, of a woman bowing her head while passing by, a farmer eating cheese and moving his jaws, a horseman removing his hat and then replacing it. Himself an occasional instrument maker, Nollet also described a moving slide of a blacksmith working at an anvil.[18] It seems fair to say that by the middle of the 18th century the depiction of motion had become a central and essential capability for the magic lantern. A pair of long panoramic slides used simultaneously also provided a way to project movement with the magic lantern, and here the central subject that became like the windmill a staple image for more than a century was the representation of ships entering a harbour or a seafaring scene. In 1770, Edme-Gilles Guyot suggested representing a storm at sea, with one slide containing the action of the waves "from its least movement through to the terrifying storm" and a second slide containing "ships of different aspects and sizes and at various distances, along with a few clouds." Passing the two slides through the lantern simultaneously produced the effect of a growing or diminishing storm populated with wave-tossed ships. Guyot also reminded the lanternist that "One must take care that the various representations are not sharply divided from each other, but on the contrary grow step by step and are progressive. It is easy to see that this must all be very carefully painted, since the beauty of the representation depends on this alone..."[19] Guyot's description of this moving effect circulated widely around Europe over the next score of years, not only in the German edition of his own book translated with additions by Johann Christian Thenn in 1772-77, but also in a pirated edition, again with additions, issued in English by William Hooper, who suggested the lantern could be "rendered much more amusing, and at the same time more marvellous, by preparing figures to which different natural motions may be given, which every one may perform according to his own taste..."[20] Guyot's suggestions then began to appear in a series of books on "Natural Magic" which combined elements of popular science with demonstrations of popular amusements.[21] Less and less concerned with experimental physics, but relying on the public's intense desire to see spectacular physical effects, these later books on magical mathematics bore witness to what historian Barbara Stafford has called "the eighteenth-century culture of curiosity."[22] Books by Johann Christian Wiegleb in 1779, Johann Samuel Halle in 1783, and Christlieb Benedikt Funk in the same year[23] began to emphasize instruction in showmen's tricks for the lantern, again following Guyot's lead and using his technique of depicting a storm at sea, but now also describing lantern projections onto smoke that could give the illusion of a figure hovering in the air. The context of these books is one further step away even from the "rational recreations" that entertained an emerging educated class during the Enlightenment; along with experiments and demonstrations of electricity, magnetism and optics, their pages were filled with card tricks, numerology, recipes for preserving sour cherries and instructions for making charm mirrors. Now moving lantern illusions were associated with the appearance of ghosts and with a long list of optical deceptions that used refraction and reflection to mystify and confuse the eyes of a viewer.

In 1789 in Vienna, the magic lantern itself began to move. A travelling science demonstrator and showman named Paul Philidor devised improvements in his exhibition intended to warn the interested public about the deceptions of the notorious "ghost-raiser", Johann Georg Schröpfer. A coffeehouse owner who had committed suicide in 1774, Schröpfer had used some of Guyot's optical tricks in his private séances conversing with the spirit world; he had organized a breakaway lodge of Freemasons in Leipzig, and claimed for himself the only true knowledge of ancient mysteries. Schröp-

fer's death precipitated a vigorous public debate about his ability to raise the spirits of the dead, bringing the deceased cult leader notoriety throughout Europe. One result of the intense discussion about Schröpfer's work was the development of an optical show that repeated his methods of raising ghosts and attempted to explain his trickery. Paul Philidor was a pioneer of this exhibition that simultaneously provided both thrills and explanations, in a darkened room specially decorated with death's heads, self-extinguishing candles, a magic circle and other arcana. During his stay in Vienna he improved the techniques of his show so that the three ghosts he called up at each session "took a few steps forward towards the audience" before they again disappeared from view.[24] Philidor produced this startling effect which set his ghosts in motion towards the audience by concealing his magic lantern behind a hidden projection screen that was lowered into the room after the hall was dark, and then moving his magic lantern away from the screen, causing its image to suddenly enlarge. Evolving in his presentation of "Schröpfer'sche Geistererscheinungen" into a rapidly moved lantern set on rails or small wheels, Philidor made his ghosts expand hugely and seem to hover directly over his audience, after which they grew infinitesimally small again before seeming to disappear through the floor of the room to the centre of the Earth. Fully developed by the time he transferred his show from Vienna to Paris for a five-month run beginning in December, 1792, Philidor's techniques and themes were copied by the balloonist and showman Jules-Etienne Robertson for his own Paris outings at the rue de l'Échiquier in January 1798 and then at an elaborately decorated former Capuchin cloister, Couvent des Capucines, from January 1799. Called by now a Phantasmagoria show, this elaborate exhibition of moving lantern effects and moving slides, was supplemented by the projection of opaque moveable puppets and the use of sophisticated optical trickery. The Phantasmagoria show, with its haunting decorations and memorable projections, often accompanied by the eerie sounds of the glass harmonica and the pounding of a violent thunderstorm, and sometimes even involving unannounced electrical shocks for the audience, was exhibited widely across Europe and North America early in the 19th century, and lingered on for most of the century in various guises, including that of the fairgrounds "ghost show" of the 1880's and 1890's.

With motion extended to the lantern itself in Phantasmagoria shows[25] a wide repertoire of moving images was now available for diverse lantern projections that ranged from sci-

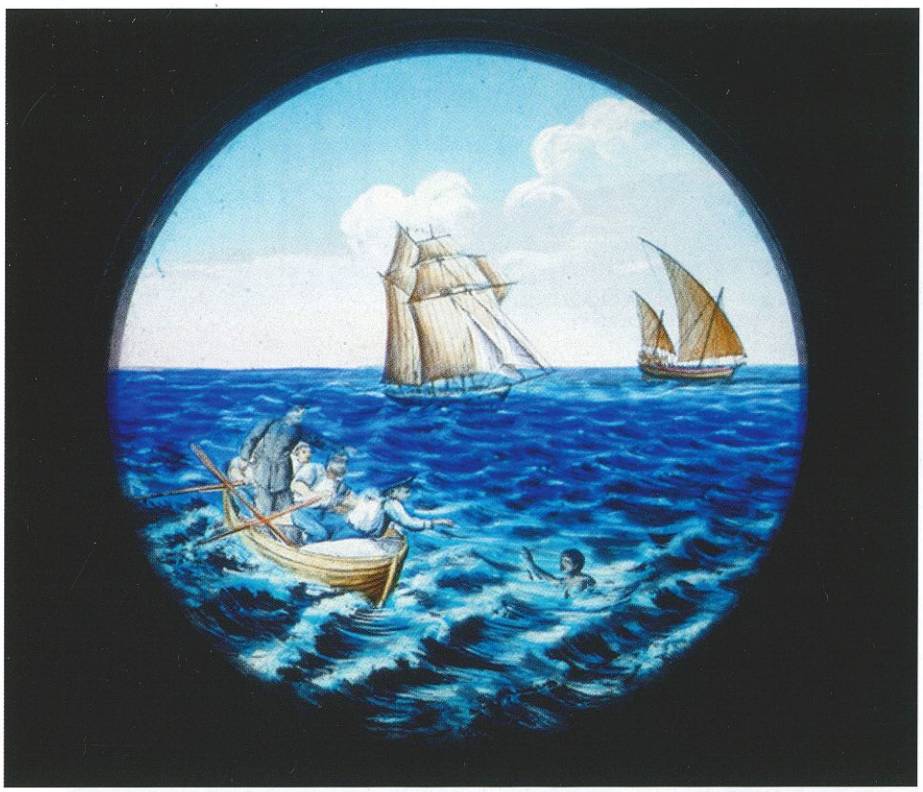


fig. 10: Mechanical disc for the magic lantern, England c. 1860

entific lectures to frightening entertainments. In the nineteenth century the simple mechanical slides of Wiegleb and Musschenbroek became finely machined works of brass gears that illustrated the movements of the planets around the sun, the moon around the earth, constellations across the skies, eclipses of the sun or moon, and many other astronomical events, in sum miniature orrerys that demonstrated the most complex interrelationships of moving bodies. In the hands of manufacturers like Carpenter and Westley or Newton & Co. mechanical slides for astronomical lectures became miniature works of fine craftsmanship. Simultaneously, some of the same mechanical sophistication was applied to the making of Chromatropes, usually two counter-rotating disks painted with elaborate abstract designs that produced an illusion of depth or visual texture. A traditional end to dissolving view lantern shows, a display of chromatropes – sometimes called "fireworks without powder" – in the hands of a skilled lanternist could be a splendid and astonishing finale of rhythmically abstract movement. Further nineteenth century experiments with projected motion in the magic lantern, particularly in the startling exhibitions of stroboscopic projection by Ludwig Leopold Döbler beginning in January 1847, led to the invention of cinematography at the end of the century, a new technology that extended a three hundred year old practise. Like the horseless carriage that became the automobile, early accounts of the cinema were couched in the language of the magic lantern; a cinematograph was nothing more than "a lantern equipped with a mechanical slide changer"[26] and a film "for projecting a Living Picture is nothing more, after all, than a multiple lantern slide...".[27]

While a re-examination of the context of the invention of the cinema has motivated much recent research into the later nineteenth century history of moving images in the magic lantern, it has been too little recognized that the projection of moving images was an essential and constant element in magic lantern practise from the moment of its discovery in the middle of the seventeenth century. At first seen just as one of the many optical amusements that were taken up by gentlemen fascinated with recently devised instruments like the microscope, telescope, polemoscope, and portable camera obscura, the magic lantern never developed an experimental purpose that was useful for scientific investigation. The microscope, which at first was an after-dinner entertainment set piece, and the telescope, which was useful for ship's officers and a few astronomers, but which found its broadest dissemination in the form of the spyglass as a gentleman's fashion accessory, within a few decades of their discovery were being used by experimental scientists to reveal previously unseen and remarkable aspects of nature.[28] But the magic lantern,

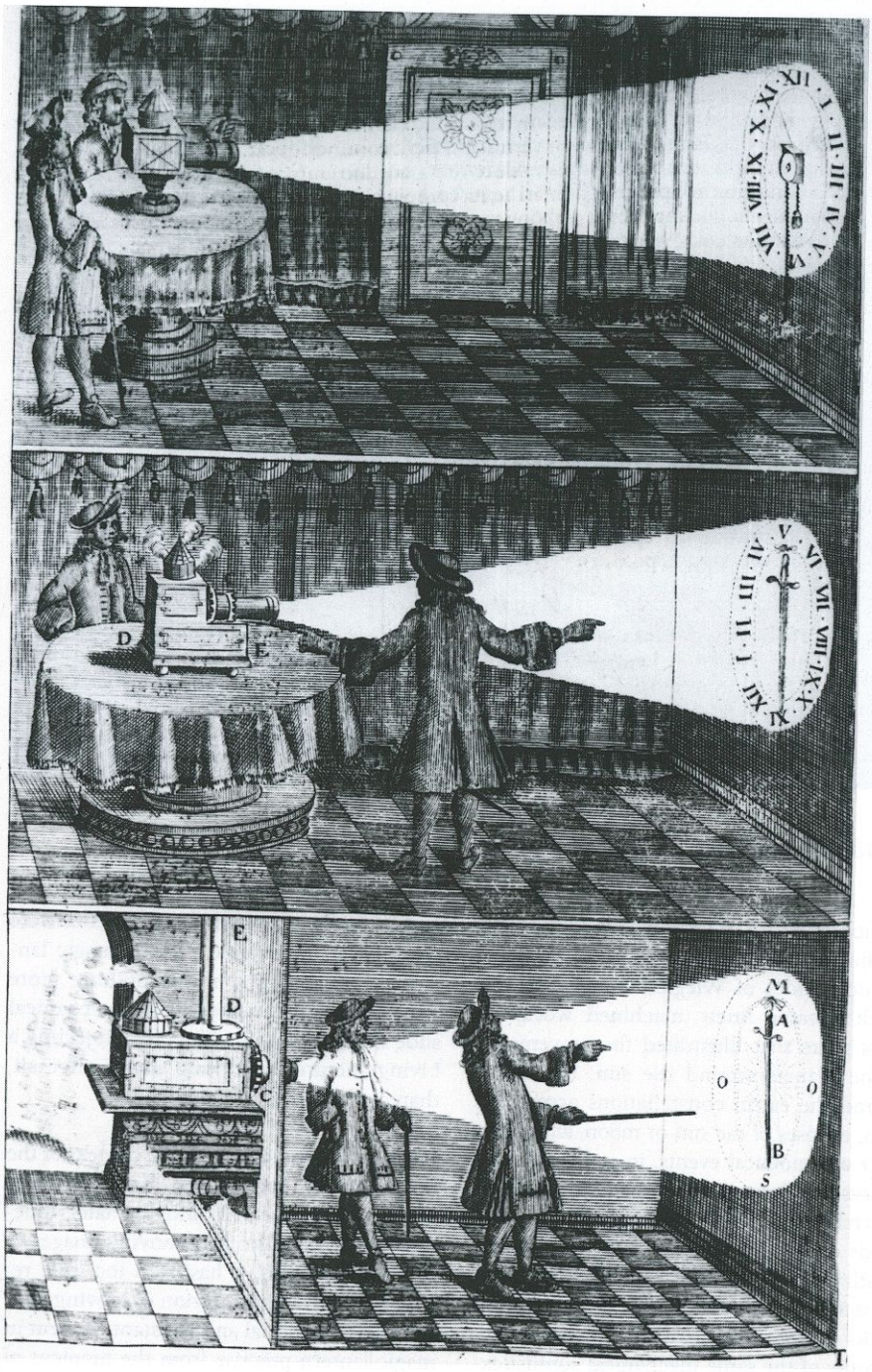


fig. 11: Johannes Zahn, Oculus Artificialis Teledioptricus, Nuremberg 1702. Laterna Magica clock

equally at first another device showing the power of lenses to refract light, never found any genuinely scientific purpose. Instead, as a device that at its essence was one that could reproduce motion, the magic lantern became the progenitor of the modern media of film and television.

Notes:

(1) On Patin's visit to Nuremberg, see Julius Pirson, Die Beziehungen des Pariser Arztes Charles Patin zu Nürnberger Freunden und Gönnern, in Mitteilungen des Vereins für Geschichte der Stadt Nürnberg, Vol. 49 (1959), p. 274-338.

(2) Charles Patin, Quatre Relations historiques par Charles Patin, médicin de Paris (Basel, 1673), p. 236. The English text is taken from a translation published in London in 1696 as Travels thro' Germany, Swisserland, Bohemia, Holland and other parts of Europe.

(3) ibid., p. 237-8.

(4) Charles Patin, ibid., p. 238-9.

(5) The key position of Huygens in both the early development and possibly the dissemination of the magic lantern is fully explored in Laurent Mannoni, Le grand art de la lumière et de l'ombre, archéologie du cinéma (Paris, 1994: Nathan), esp. pp. 42-60.

(6) The drawings are in Manuscript Book A, at p. 152, between pages dated February 24, 1659 (p. 85) and October 11, 1659 (p. 155). Christiaan Huygens, Œuvres complètes (The Hague, 1888-1952: Société Hollandaise des Sciences/Nijhoff), Vol. 22, p. 196-7.

(7) See, for example, William Molyneux, Dioptrica Nova. A Treatise on Dioptricks, in Two Parts... (London, 1692: Benj. Tooke), Plate 38, Fig. 2; Jacques Ozanam, Récréations mathématiques et physiques... (Paris, 1696: Chez Jean Jombert), Planche 63, p. 452, Fig. 220; Christian Friedrich Wolff, Elementa mathesos universae (Magdeburg, 1713: Libraria Rengeriana), Vol. II, Tab. XI, Fig. 86; Willem Jakob 'sGravesande, Physices Elementa Mathematica (Leiden, 1721: Petrum Vander), V. 2, Tab. XIV, Fig. 1; Pierre Polinière, Expériences de Physique (Paris, 1728: Moette/Prudhomme/Cavelier), Planche 17, Figs. 15-17; Marc Mitouflet Thomin, Traité d'optique méchanique (Paris, 1749: Chez Coignard/Boudet), Planche 4, Fig. 5; others.

(8) Gottfried Wilhelm Leibniz, "Drôle de Pensée, touchant une nouvelle sorte de Representations", handwritten document, Eigenhändige Aufzeichnungen A, Leibniz Archiv, Niedersächsische Landesbibliothek, Hannover. For a discussion of this early Weltausstellung, see Deac Rossell, "Leibniz and the Lantern", in The New Magic Lantern Journal, Vol. 9, No. 2, p. 25-26.

(9) Bonifacius Heinrich Ehrenberger [or: Samuel Johann Rhaenus], Novum et Curiosum Laternae Magicae augmentum... (Jena, 1713), p. 7. On the authorship of this thesis, Ehrenberger or Rhaenus, see Hauke Lange-Fuchs, "On the origin of Moving Slides", in The New Magic Lantern Journal, Vol. 7, No. 3, p. 10-14, esp. 11-2.

(10) Johann Conrad Creiling, Phenomena Laternae Magicae... (Tubingae, 1705), p. 4.

(11) Zacharias Conrad von Uffenbach, Merckwürdige Reisen durch Niedersachsen, Holland und England... (Frankfurt/Leipzig/ Ulm, 1753-4: Stettinische Buchhandlung), p. 62-3.

(12) ibid., p. 51.

(13) Petrus van Musschenbroek, Beginselen der natuurkunde, Beschreven ten dienste der Landgenooten (Leiden, 1736: Samuel Luchtmans). The often cited 1739 edition is for the French translation of this work issued by the same publisher as Essai de physique.

(14) Willem Jakob 'sGravesande, Physices Elementa Mathematica, experimentis confirmata. Sive Introductio ad Philosophiam Newtonianam. (Leiden [Lugduni Batavorum], 1720-21: Peter Vander). For most of the instruments in this book, the precise contributions of 'sGravesande and Jan van Musschenbroek remain indeterminate: the two lived only a few houses from each other on the same canal in Amsterdam, and no correspondence or written notes between them is known. On their relationship, and the Musschenbroek family overall, see Peter de Clercq, At the Sign of the Oriental Lamp. The Musschenbroek workshop

in Leiden, 1660-1750, (Rotterdam, 1997: Erasmus Publishing). esp. pp. 73-102.
(15) Zacharias Conrad von Uffenbach, op. cit., (Note 11), entry for 20 January 1711, p. 433. The father mentioned would be Johan Joosten van Musschenbroek (1681-1707). See de Clercq, op. cit. (Note 14). The family had been making magic lanterns since at least 1675.
(16) Musschenbroek workshop catalogue of c. 1730. The catalogue bound with the book includes the same references and is from August, 1735. See de Clercq, op. cit. (Note 14), p. 231. On the dating of this catalogue, see ibid., p. 225.
(17) A catalogue of 1748 mentions a slide with a man forging iron. See de Clercq, op. cit. (Note 14), p. 248.
(18) Abbé Jean-Antoine Nollet, L'Art des Expériences, ou avis aux amateurs de la physique... (Paris, 1743: Chez P. E. G. Durand), III, p. 335-6.
(19) Edme-Gilles Guyot, Nouvelles Récréations Physiques et Mathématiques (Paris, 1769-1770: Gueffier), Tome III [1770], p. 184.
(20) William Hooper, Rational Recreations... (London, 1774: L. Davis/J. Robson/B. Law/G. Robinson), p. 39. See also, "Recreation X. To represent a tempest by the magic lantern.", p. 40.
(21) See, for example, the nearly congruous description of slides depicting a storm at sea by Johann Christian Wiegleb in Unterricht in der natürlichen Magie (Berlin/Stettin, 1779: Friedrich Nicolai), p. 152-3.
(22) Barbara Maria Stafford, Artful Science. Enlightenment entertainment and the eclipse of visual education (Cambridge/London, 1994: MIT Press), p. 29.
(23) Johann Christian Wiegleb, Unterricht in der natürlichen Magie (Berlin/Stettin, 1779: Friedrich Nicolai); Johann Samuel Halle, Magie, oder die Zauberkräfte der Natur... (Berlin, 1783: Joachim Pauli); Christlieb Benedikt Funk, Natürliche Magie, oder Erklärung verschiedener Wahrsager- und natürlicher Zauberkünste (Berlin, 1783: Friedrich Nicolai). Wiegleb's book is a thoroughgoing revision and expansion of Johann Nicolaus Martius, De magia naturali... (Leipzig, 1715), and Wiegleb's work was itself later expanded by Rosenthal in 20 volumes, 1786-1805. Here, the magic lantern and its projection of movement became entwined with many books on magic by authors like Johann Conrad Guetle, Karl von Eckartshausen and others.
(24) Wiener Zeitung, 1789, p. 3223-4.
(25) An entirely separate evolution of moving magic lantern practise took place in Japan, where Jesuit missionaries introduced the optical instrument in the 1680s: adapted to a long tradition of shadow plays presented on a large horizontal paper screen stretched across the front of an audience, small hand-held wooden lanterns operated by up to a half-dozen lanternists who walked around behind the screen projected multi-image narratives in a show called Utsushi-e. See J. L. Anderson, "Spoken Silents in the Japanese Cinema; or, Talking to Pictures: Essaying the Katsuben, Contextualizing the Texts", in Arthur Nolletti, Jr., and David Desser, eds., Reframing Japanese Cinema (Bloomington/Indianapolis, 1992: Indiana University Press), pp. 259-311, esp. pp. 266-71; and [Machiko Kusahara and Erkki Huhtamo] "Utsushi-e (projected images)", in David Robinson, Stephen Herbert and Richard Crangle, eds., Encyclopedia of the Magic Lantern (London, 2001: The Magic Lantern Society), p. 314.
(26) C. Francis Jenkins, Animated Pictures (Washington, D. C., 1898), p. 100.
(27) Henry V. Hopwood, Living Pictures. Their history, photo-production and practical working. (London, 1899), p. 188. Later on the same page, Hopwood notes "...it may be assumed that whatever is good enough for a lantern slide is the correct thing in treatment for a kineto-film,..."

fig. 12: Travelling showman with peep-box, in: Het groote Tafereel der Dwaasheid, Holland 1720

(28) On the non-scientific origins and uses of early optical instruments, see Gerald Turner, Collecting Microscopes (London, 1981); A. Van Helden, "The Birth of the Modern Scientific Instrument", in J. G. Burke, ed., The Uses of Science in the Age of Newton (Berkeley, 1983); and J. A. Bennett, "The Social History of the Microscope", in Journal of Microscopy, 155:3 (1989).

Anschrift des Verfassers:

Deac Rossell, BA
Lecturer in European Studies
Goldsmiths College, University of London
74 Manor Ave. 44
London SE 41 TE, GB
e-mail: d.rossell@gold.ac.uk