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Deac Rossell

## The use and mis-use of technological argument in media history

With the very useful and revealing attention given in media history studies in recent years to accounts that emphasize reception, exhibition, cultural contexts, psychology, screen language and economic concepts, there has been very little new work done from the perspective of technology. Even worse, an approach to film history through technology has recently been strongly criticized by several leading scholars. Charles Musser, in dismissing an account that suggests »a kind of technological determinism in which film language is a product of technology and film art exists within the framework of that language«,<sup>1</sup> substitutes instead an account based on »cultural practise«, or one that places the cinema »within a larger context of what we shall call the history of screen practise«,<sup>2</sup> a practise where there is a technological component, but one that is not determinative. Richard Brown, who argues for a business and economics-based historical account of early cinema practise in his study of the Biograph Company, is even more blunt: »While considerable attention has been given over many years to charting the technical development of cinematography... [after 1896] ... Technical aspects were simply variations on a theme already established; not surprisingly, this function, whilst important, moved from an active to a passive or supportive role.«<sup>3</sup> After all, for both Musser and Brown, and many others, the technological approach to early cinema is one that we all know very well, and one which we know leads to eternal arguments about the precise origin and meaning of specific forms of intermittent movements, shutters, gears and motors. As Musser wrote about the intimidating technical scholar of early American film inventors, Gordon Hendricks, »Hendricks's knowledge and erudition were not only indisputable, they were virtually unfathomable ... [He] not only defined the field, he made it a sterile one.«<sup>4</sup>

1 Charles Musser, *The Emergence of Cinema. The American Screen to 1907* (New York, 1990: Charles Scribner's Sons), S. 16.

2 Ebd., S. 15.

3 Richard Brown, Barry Anthony, *A Victorian Film Enterprise. The History of the British Mutoscope and Biograph Company, 1897-1915* (Trowbridge, 1999: Flicks Books), S. 6

4 Charles Musser, *Edison Motion Pictures 1890-1900, An Annotated Filmography* (Washington, D.C./Pordenone, 1997: Smithsonian Institution Press/Le Giornate del Cinema Muto), S. 20-21.

Sadly, although my own work comes principally from a technological perspective, I can only agree with my colleagues quoted above. But the problems they, and others, describe resides for me not in taking a technological approach to media history, but in using a kind of methodology for the history of technology that is both outmoded and discredited, one that is no longer used by contemporary technical historians in any other field, whether studies of the technological evolution of bicycles or of guided missiles. Worse, while they add new and important material to our understanding of early cinema from a cultural or economic perspective, my good colleagues – and others – have left the basic story of the development and first appearance of moving pictures wholly intact. For the basic outline of whom, of what companies, of what materials, were significant in the discovery and presentation of moving pictures – of screen practise – has remained unchanged. And this outline was delivered by precisely those historians who took a narrow and technologically determinative approach to the material.<sup>5</sup> Although technical historians published from early in the 20<sup>th</sup> century, the scarcity of work from this perspective has meant that several key books were republished or re-issued, extending the methodology and information of even the earliest historians well into the present day: in the first generation Henry Hopwood,<sup>6</sup> Carl Forch,<sup>7</sup> David Hulfish<sup>8</sup> and F. Paul Liesegang<sup>9</sup>; in the middle generation Martin Quigley, Jr.,<sup>10</sup> C. W. Ceram,<sup>11</sup> Friedrich von Zglinicki<sup>12</sup> and Joseph H. North<sup>13</sup>; more recently Jacques Deslandes<sup>14</sup>, H. Mark Gosser<sup>15</sup>

- 5 That is to say, apart from those (many) historians who were exclusively supporting only a narrow nationalistic viewpoint towards the invention of moving pictures. The period c. 1880-1900 was one of remarkable international experiment and accomplishment, and very few historians have adequately researched across borders to integrate developments which were, at the time, almost without exception transmitted quickly from country to country through personal contact, patent publication, and technical journals.
- 6 Henry V. Hopwood, *Living Pictures. Their history, photo-production and practical working*. London, 1899: The Optician & Photographic Trades Review); reprinted New York, 1970: The Arno Press.
- 7 Carl Forch, *Der Kinematograph und das sich bewegende Bild* (Wien und Leipzig, 1913: A. Hartleben's Verlag).
- 8 David S. Hulfish, *Motion Picture Work* (Chicago, 1913: American School of Correspondence); reprinted New York, 1970: The Arno Press.
- 9 Franz Paul Liesegang, *Zahlen und Quellen: zur Geschichte der Projektionskunst und Kinematographie* (Berlin, 1926: Deutsches Druck- und Verlagshaus); reprinted as *Dates and Sources. A contribution to the history of the art of projection and to cinematography*, translated and edited by Hermann Hecht (London, 1986: The Magic Lantern Society of Great Britain).
- 10 Martin Quigley, Jr., *Magic Shadows: The Story of the Origin of the Motion Picture* (Washington, D.C., 1948: Georgetown University Press).
- 11 C. W. Ceram [Kurt Wilhelm Marek], *Archaeology of the Cinema* (New York, 1965: Harcourt, Brace & Co.).
- 12 Friedrich von Zglinicki, *Der Weg des Films* (Berlin, o. J. [1956]); reprinted Hildesheim/New York, 1979: Olms Presse.
- 13 Joseph H. North, *The Early Development of the Motion Picture: 1887-1909* [Ph. D., Cornell University, 1949] (New York, The Arno Press, 1973).

and Virgilio Tosi<sup>16</sup>. From these writers we have received a basic story of the appearance of modern-day media which in one way or another fails to reflect the vigorous international activity of the late 19<sup>th</sup> century, which valorizes or distorts the work of certain figures like Étienne-Jules Marey, the Lumière brothers, Oskar Messter, or Robert Paul and which simultaneously ignores or undervalues others such as Ottomar Anschütz, Birt Acres, George William de Bedts, and Herman Casler. Not only is the historical map as defined nearly a hundred years ago still unaltered, so are the arguments which issue from it: as early as September, 1896 *Der Komet* published an article with the headline »Edison oder Lumière?«,<sup>17</sup> and the argument, if not always the evidence, is still familiar and active today, which is hardly a recommendation of intellectual progress in the field.

The dangers of relying on a century-old received story of the origins and evolution of the cinema are twofold. First, by using an antiquated historical pattern a number of myths are built into the accepted account of film history from the beginning, myths that obscure and dilute even the most fulsomely researched later work that leaps over technological matters and adds new and useful cultural, business, or aesthetic information to the story. New theoretical constructs built on such a shaky foundation must *a priori* be considered unreliable. Second, the survival of many technological artifacts and accounts still have a great deal to contribute to better understanding of how media came to play a central role in the modern world. The proper re-examination and re-deployment of this information from an age in which so many films, so many first-hand recollections, and so many business records have been lost is an urgent task that can enhance every area of media studies.

I have written extensively elsewhere on how a reformed technological history of the origins of cinema might be usefully begun.<sup>18</sup> What I would like to do today is to look at a specific article of F. Paul Liesegang and examine how he used his technological information, and see if an alternative technological methodology might bring more interesting and more useful perspective to bear on the subject.

14 Jacques Deslandes, *Histoire comparée du cinéma* (Tournai, 1966: Casterman).

15 H. Mark Gosser, *Selected Attempts at Stereoscopic Moving Pictures and their Relationship to the Development of Motion Picture Technology, 1852-1903* [M. A., Temple University, 1975] (New York, 1977: The Arno Press).

16 Virgilio Tosi, *El Cine antes de Lumiere* [2<sup>nd</sup>, enlarged edition] (México City, 1993: Universidad Nacional Autónoma de México).

17 Theodor Bläser, »Edison oder Lumière?«, in: *Der Komet*, Nr. 601, 26.9.1896, S. 2.

18 See Deac Rossell, »Die soziale Konstruktion früher technischer Systeme der Filmprojektion«, in: *KINtop-Jahrbuch zur Erforschung des frühen Films*, Nr. 8 (1999), S. 53-81; Deac Rossell, *Living Pictures. The Origins of the Movies* (Albany, 1998: State University of New York Press); Deac Rossell, »Double Think: The Cinema and Magic Lantern Culture«, in: *Celebrating 1895. The Centenary of the Cinema*, edited by John Fullerton (Sydney, 1998: John Libbey & Co. Ltd.), S. 27-36.

In doing so, I now go back not to early cinema, but to the history of the origins of the magic lantern.

In 1919, F. Paul Liesegang published an article about the earliest reports on the magic lantern in Germany,<sup>19</sup> an article which has been a cornerstone of the history of the magic lantern and has been used by all subsequent writers on the topic in Germany.<sup>20</sup> The article considers three figures, more or less in chronological order: Johann Franz Grienel, who Liesegang identifies only as a magic lantern maker and showman during the time he spent in Nürnberg between 1670 and 1677; Johann Christoph Sturm, who demonstrated the magic lantern in December 1672 during a course of lectures at the University of Altdorf; and Johannes Zahn, who published a splendid compendium on optics, *Oculus artificialis teledioptricus sive telescopium* in 1685/86 that included a dozen different models of magic lantern and a full explanation of their workings. Liesegang's sources for this article were works of Johann Gabriel Doppelmayr,<sup>21</sup> Johann Christoph Kohlhans<sup>22</sup> and Georg Andreas Will<sup>23</sup>, plus the books of Sturm<sup>24</sup> and Zahn.<sup>25</sup> Liesegang's article opens with a brief review of the invention of the magic lantern by Christiaan Huygens around 1659, and of the activities of Thomas Walgenstein in the 1660s. He reproduces a sketch of the optical system of Walgenstein's lantern from Claude François Milliet Dechales,<sup>26</sup> and another sketch

- 19 Franz Paul Liesegang, »Die ältesten Nachrichten über die Zauberlaterne aus Deutschland«, in: *Central-Zeitung für Optik und Mechanik*, Jg. 1919, Nr. 8 & 9. My copy of this article, from the Bibliothek of the Deutsches Museum, München, is a Sonder-Abdruck from the *Central-Zeitung*, and is paginated only 1-6.
- 20 Liesegang's article, for example, has been used by Friedrich von Zglinicki, *Der Weg des Films* (Hildesheim/New York, 1970: Oms Presse); Jürgen Berger, »Die Projektion. Anmerkungen zur Geschichte der Laterna Magica«, in: Almut Junker, et. al., *Laterna Magica – Vergnügen, Belehrung, Unterhaltung. Der Projektionskünstler Paul Hoffmann (1829-1888)* [Ausstellungskatalog] (Frankfurt/M. 1981: Historisches Museum Frankfurt), S. 29-54; Winfried Ranke, »Magia naturalis, physique amusante und aufgeklärte Wissenschaft«, in: Detlef Hoffman und Almut Junker, *Laterna Magica. Lichtbilder aus Menschenwelt und Götterwelt* (Berlin, 1982: Frölich & Kaufmann GmbH); and is annotated in Hermann Hecht, *Pre-Cinema History. An Encyclopedia and Annotated Bibliography of the Moving Image Before 1896* (London/Melbourne/Munich/New Jersey, 1993: Bowker/Saur), Nr. 505, S. 346. This article was published in Liesegang's most fertile period: eight articles on aspects of the origin of the magic lantern or camera obscura appeared in 1919, and nine more the following year.
- 21 Johann Gabriel Doppelmayr, *Historische Nachricht von den Nürnbergischen Mathematicis und Künstlern* (Nürnberg, 1730: Peter Conrad Monath).
- 22 Johann Christoph Kohlhans, *Neu-erfundene mathematische und optische Kuriositäten* (Leipzig, 1677: Friedrich Lanckischen sel. Erben).
- 23 Georg Andreas Will, *Nürnberger Gelehrten-Lexicon, oder Beschreibung aller Nürnbergischen Gelehrten ...* (Nürnberg und Altdorf, 1755: Lorenz Schüpfel).
- 24 Johann Christoph Sturm, *Collegium experimentale, sive Curiosum* (Nürnberg, 1676: Wolfgang Maurit Endter & Johann Andreas Endter).
- 25 Johannes Zahn, *Oculus artificialis teledioptricus sive telescopium ...* (Herbipoli, 1685/86: Heyl).
- 26 Claude François Milliet Dechales, *Cursus seu Mundus mathematicus* (Lyon, 1674: Ex officina Anissoniana).

from Sturm, and considered that since both lantern systems used two biconvex lenses, no technological progress had been made in Germany since the optical system was the same as that of Walgenstein and Huygens from the previous decade. In making this judgement, Liesegang is following his lifelong habit, and the habit of many of his contemporaries and followers, including Carl Forch and Hans Kökke, in considering that technological innovation comes only with change – and better, an advance – in the fundamental operating principles of an apparatus. This juncture where technology is abstracted and expressed as scientific principle is common in older technical historians, and particularly so in Germany, where the idea that only an innovation that demonstrated a new principle was of value was even written into the patent laws. Unlike either Great Britain or America, the German patent office reserved the separate category of »Gebrauchsmuster« for lesser patents that showed an innovation ›only‹ in design or construction, but not in an instrument's basic operation. Secure in the idea that only fundamental principles, scientific principles, were of value, the patent office in Berlin then threw out all of the documentation of their Gebrauchsmuster in the early 1930s when they needed more space, thereby extinguishing a significant resource for media history.

Liesegang, then, made a conservative and common conclusion about the first reports of the magic lantern in Germany, if an abstract and narrow one: it was nothing new, nothing special, his historical sources were just the next chronological step in the story of the magic lantern. He did not even note that Sturm's illustration presented »for the first time a practical model of the whole instrument«, as John Barnes did writing in 1970.<sup>27</sup> But a consideration of his three figures, Griendel, Sturm and Zahn, from a slightly different technological perspective, one that is not so narrowly abstract, begins to show the limits of Liesegang's methodology, and new questions also arise when his sources are re-examined from this perspective.

Sturm's illustration of the magic lantern has an important difference from the rough sketches that were published earlier: the lantern is in the form of a horizontal cylinder held well aloft by a flared metal base, and the slide is inserted into the lantern through slots cut into the barrel of this cylinder itself. [Figure 1] Previous depictions of the lantern, by Petit in 1664,<sup>28</sup> [Figure 2] and by Dechales in 1674,<sup>29</sup> [Figure 3] show a lantern with a vertical cylindrical body that itself supp-

27 John Barnes, *Barnes Museum of Cinematography. Catalogue of the Collection, Part 2: Optical Projection* (St. Ives, Cornwall, 1970: Barnes Museum of Cinematography), S. 14.

28 Drawn in a letter to Christiaan Huygens of 28 November 1664. Société Hollandaise des Sciences, eds: *Oeuvres complètes de Christiaan Huygens*. Le Haye, 1888-1950: Martinus Nijhoff. V. 4, p. 266. Note that in this volume the letter is incorrectly dated to 1662, a date used by several secondary sources; see correction in V. 13, p. 161.

29 Illustrated in Dechales, *Cursus seu Mundus mathematicus, Bd. II, S. 655*.

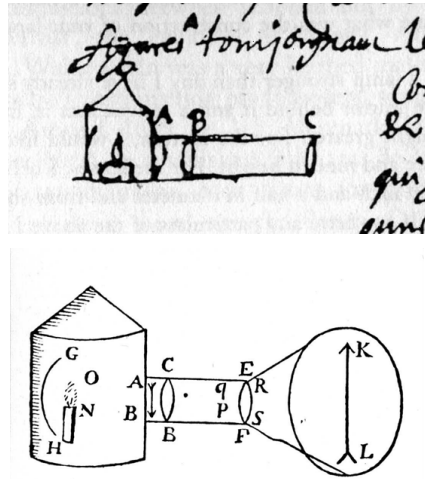
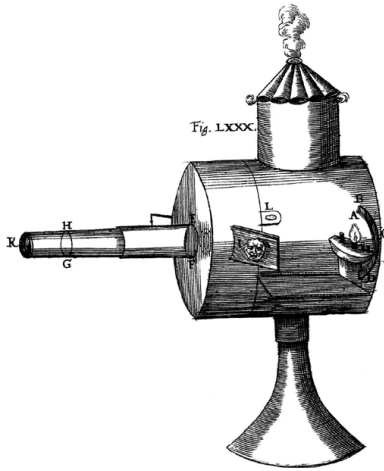


Figure 1-3

orts an extended tube for the lenses about half-way up; slides are placed in slots at the beginning of this lens tube. The lantern illustrated by Sturm is, then, of a decidedly different construction and design than that of Walgenstein, or, assumedly, Huygens and others in the west of Europe. Lanterns of similar construction were built only for about 50 years or less, and only in southern central Europe. This horizontal cylindrical form, often elevated on a flared cone, and always with the slide stage in either the barrel of the lantern housing itself or in the middle of the first (and largest diameter) lens tube, but never at the junction between the lantern body and its lens protrusion, are illustrated in works by Zahn<sup>30</sup> (1685/86), [Figures 4 & 5] Müller<sup>31</sup> (1704), [Figure 6] Rhaenus<sup>32</sup> (1713), [Figure 7] and verified by three surviving lanterns bought in southern Germany probably in 1699. [Figure 8] By around 1715 the form seems to have disappeared; a surviving lantern from an unidentified maker which I date around 1720-30 [Figure 9] is clearly a transitional design moving towards the kind of vertical lamp-house or square lantern design that was a parallel construction made throughout the period and which would become the standard lantern shape.<sup>33</sup>

30 Zahn, *Oculus artificialis*.

31 Matthaeus Christianus Müller, *De Laterna Magica* (Jena, 1704).

32 Samuel Johann Rhaenus, *Novum et Curiosum Laternae Magicae Augmentum* (Jena, 1713).

33 The horizontal cylindrical lantern was also illustrated in Stéphane Chauvin, *Lexicon Philosophicum secundis* (Leoverdiae, 1713); Chauvin based his illustration on Sturm. A few decorative horizontal cylindrical lanterns were produced in Nürnberg in the 1890s, particularly by Jean Schoenner, Ernst Planck and Georges Carrette, as manufacturers there issued toy lanterns in highly decorative designs including lanterns in every conceivable shape such as the Eiffel To-

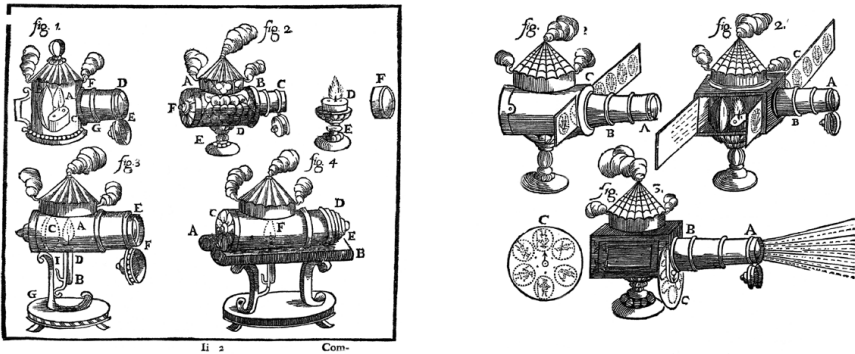


Figure 4-5

So we have here a particular lantern construction which exists for a limited time in a specific geographical area. Should this construction be admitted as a part of the technological evolution of the magic lantern? Or should we remain with Liesegang and his reliance on the abstract principles of its optical system, with its two biconvex lenses? To quote John Staudemeier, a »contextual history of technology affirms as a central insight that the specific designs chosen by individuals and institutions necessarily embody specific values.<sup>34</sup> The design is crucial here, especially as it exists in a limited time and place, and its first appearance is with Liesegang's three central figures. In this particular case, in contrast to the lanterns being built in Paris, London, and Amsterdam, the all-metal construction and very elaborate flared base indicates a maker who had access to the highly skilled Nürnberg metalworkers, who could turn out such fancy shapes with-out appreciably adding to the cost or time of manufacture. This was a practical and economically viable resource that was not easily available elsewhere. Incorporating the horizontal cylinder design into the technical description of this lantern, then, let us return to Liesegang's article for two further tasks. First, an attempt to sort out the chronology between his three figures, with special reference to the activities of the mysterious Griendel and to his relationship to Sturm; and second, an application to these figures of a recent methodology drawn from principles used by historians working with the sociology of the history of technology.

Liesegang quotes extensively from the description of a lantern show given by Griendel that is reported by Kohlhans in 1677, but fails to recognize that Kohlhans is repeating a description previously published in 1673. Griendel's show

wer, an automobile, a log cabin, Buddha, and other curious shapes.

34 John M. Staudemeier, S. J., *Technology's Storytellers. Reweaving the Human Fabric* (Cambridge/London, 1989: MIT Press/Society for the History of Technology), S. 165-166.

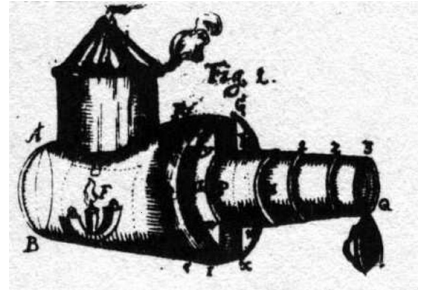
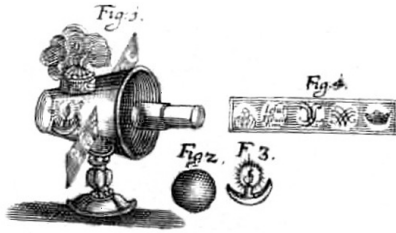


Figure 6-7

was actually seen not by Kohlhans, but by a travelling medical doctor from Paris, Charles Patin.<sup>35</sup> In continuing, I do want to let the estimable historian Liesegang off the hook here a little bit. He is, after all, serving only as an example of a tendency in technical historical methodology, and not at all as an example of an inadequate historian. We owe much to him and to his pioneering work.<sup>36</sup> If he knew that Kohlhans was using Patin's 1673 description of Griendel's lantern exhibition, or if he had found this non-technical source himself, I think he would have had further thoughts about the relationship between Griendel and Sturm, a topic which he examined closely in his article, and which clearly interested him.<sup>37</sup>

Two further facts now complete this part of the case. First, Charles Patin was in Nürnberg in early July 1672,<sup>38</sup> and it was at that time that he saw Griendel's magic lantern exhibition. This is five months before Sturm demonstrates a magic lantern as a »Neuheit« in his lectures, and surely would have caught Liesegang's attention. Second, we now know that Griendel sent a list of some 25 different

35 Charles Patin, *Quatre Relations Historiques*, (Basle, 1673). A problem here which is pertinent to the topic is that Liesegang was very little interested in exhibition, and may not have bothered to trace Kohlhans's source any further. His habitual disregard of matters which are not »technical« is also found in his unpublished biography of Ottomar Anschütz of 1940 (manuscript at the Agfa-Foto-Historama, Museum Ludwig, Köln), which is full of carefully (often mathematically) worked out material on lenses and shutter timings, but is relatively dismissive of Anschütz's exhibitions of the Schnellseher. Here, I am not trying to suggest that exhibition is also a part of technical history, but in this particular case tracing the exhibition, as we shall see, is a way of determining an accurate chronology of Griendel's activity, something which Liesegang would, I think, very much have appreciated.

36 At the same time, it does seem to me that later authors who used Liesegang's work could have taken a more careful look at it and at his sources and come to some of my same conclusions.

37 Here, Liesegang is also led into a direct error. In the middle of his description of Griendel's magic lantern show, Kohlhans uses the phrase, »wie der Autor schreibt«, and Liesegang takes this to mean »daß Griendel eine Schrift über seine »optische Latern« herausgeben habe, die uns leider nicht bekannt geworden ist.« (Liesegang, *Die ältesten Nachrichten über die Zauberlaterne*, S. 3.) But Kohlhans is referring to Patin's 1673 Basle publication (Patin, *Quatre Relations-Historiques*), or its later 1674 edition published in Lyon.

38 Julius Pirson, »Die Beziehungen des Pariser Arztes Charles Patin zu Nürnberger Freunden und Gönnern«, in: *Mitteilungen des Vereins für Geschichte der Stadt Nürnberg*, Bd. 49 (1959), S. 274-338, esp. S. 278-282.



Figure 8-9

optical instruments that he was making in Nürnberg to Gottfried Wilhelm Leibniz on 30 December 1671, and that this list included:

16. Ein optische Latern, welche alles, waß man will, figuren, gemählder, Brustbilder, conterfeit, Jaggereyen, ja ein ganze Comedia mit allen lebhjafften Farben, aber risens grösse in einem finstern gemach oder Saal auf eine weisse wand, oder weisses Duch präsentiert, man kans so groß machen, daß ein reiniges Bild von undten biß oben die wandt eines hohen Saal einnimbt, ist ein Curios und högst verwunderliches gereth.<sup>39</sup>

So now that it has been established Griendel's activity is not, as Liesegang reports, »aus dessen Nürnberger Zeit.[...], die von 1670 bis 1677 läuft,«<sup>40</sup> but was well established by the end of 1671, it is clear that the assumption might well be made that Sturm got his magic lantern, demonstrated as a »Neuheit«, from Griendel. In fact, Liesegang pursues this point specifically, and shows that Sturm and Griendel knew each other,<sup>41</sup> and further that there was some tension

39 Ernst Gerland, *Leibnizens nachgelassene Schriften physikalischen, mechanischen und technischen Inhalts* (Leipzig, 1926), Bd. 1, S. 201-204, Brief Nr. 99. The list of instruments Griendel sent to Leibniz is not reproduced with this letter, although its existence is noted. I am deeply indebted to Inge Keil for bringing this material to my attention, and for a copy of the list of instruments prepared by the late Dr. Albert Heinekamp of the Leibniz Archiv, Niedersächsische Landesbibliothek, Hannover.

40 Liesegang, »Die ältesten Nachrichten über die Zauberlaterne«, S. 3.

between them,<sup>42</sup> but in the end he states only the possibility of a relationship because he cannot quite determine the precise chronology of Griendel's activities.

One step that would have helped Liesegang with his task would have been to look for what Michael Callon has called an »actor network«. That is, a network of scientists, engineers, institutions and workers which describes »heterogeneous associations and the mechanisms of their transformation and consolidation.«<sup>43</sup> Such a network, in the words of Ruth Schwarz Cowan, for any individual »limits and controls the technological choices that she or he is capable of making.«<sup>44</sup> And, indeed, there is just such an »actor network« in Nürnberg at the time, one that centered around Johann Georg Volckamer (the Elder). Volckamer was a distinguished figure of the Enlightenment, a prominent member and president from 1686 until his death of the *Academia naturae curiosorum*, later called the »Leopoldina«. Volckamer, who was Patin's host and who recommended Griendel's lantern show to his visitor, kept a renowned salon for the exchange of scientific information: »Ja, sein Haus war selbst eine kleine Akademie, wo so wol einheimische, als auch fremde Gelehrte und Standespersonen öftters zusammen gekommen sind, die fürtnefl. Unterredungen dieses grund gelehrten und erfahren Mannes mit Nutzen anzuhören, auch in wichtigen Fällen und mißlichen Zuständen klugen Rath einzuholen.«<sup>45</sup> Along with Griendel, the

- 41 Liesegang is convinced that the second »Neuheit« that Sturm demonstrated in his lecture at Altdorf, a reflex camera obscura, came from Griendel – a point with which I fully agree.
- 42 Liesegang hints that it was a »Spannung« between Sturm and Griendel that kept Sturm from acknowledging Griendel as the source of his portable camera obscura. Indeed, Sturm refers at one place to »ein Nürnberger Mechaniker, der sich reichlich kühn den Namen eines Nürnberger Mathematikers anmaßt«, whom Liesegang properly identifies as a reference to Griendel. Griendel had no university diploma, which was perhaps one reason that Sturm thought he was taking liberties with his position as a newcomer to Nürnberg, but there may be yet another competition between the two men over their principal professions as architects of defensive military fortifications. When Sturm's son, Leonhard Christoph Sturm, published a work on military architecture in 1702, he was highly critical of the quality of the drawings in Griendel's military books, although he clearly felt he had to include no less than 6 »Manieren« designed by Griendel in the work. See Leonhard Christoph Sturm, *Architectura militaris hypothetico eclectica* (Nürnberg, 1702), p. 41. The author's father's commitment to his first profession is clear in this work, since he made »improvements« to many of the fortification designs collected by his son for publication, although not to Griendel's.
- 43 Michael Callon, »Society in the Making: The Study of Technology as a Tool for Sociological Analysis«, in: Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch, eds., *The Social Construction of Technological Systems. New Directions in the Sociology and History of Technology* (Cambridge/London, 1987: MIT Press), S. 93. Callon is actually quite radical in his concept of an actor network, and his controversial views have been hotly debated in recent years. He includes as an »actor« in his concept inanimate objects and institutions as well as various groups of people. For him, the task is nothing less than to »transform academic sociology into a sociology capable of following technology through its elaboration« (S. 99) and actor networks are themselves the proper object of such a study because it is actor networks that »simultaneously give rise to society and to technology.« (S. 99).
- 44 Ruth Cowan Schwarz, »The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology«, in: ebd, S. 262.

Nürnberg engraver and astronomer Georg Christoph Eimmert and the Professor of Mathematics and Physics from nearby Altdorf, Johann Christian Sturm were a part of Volckamer's close circle;<sup>46</sup> Eimmert engraved the only known portrait of Griendel while he was in Nuremberg. [Figure 10] With this local network in place, it is inconceivable then that Sturm, who as Liesegang says was not himself an instrument builder, got his magic lantern from anyone other than Griendel.

Turning just very briefly to the third figure in Liesegang's article, Johannes Zahn, it turns out that Zahn, a Canon of the Premonstrate Order in Würzburg, also had a longstanding and close relationship with Griendel, most likely dating from the time that they were both monks in Würzburg, well before Griendel moved to Nürnberg. At one point in the *Oculus artificialis*, Zahn calls Griendel his »former teacher of practical Teledioptrics.«<sup>47</sup> Zahn also devotes an entire chapter of the work to Griendel's microscope,<sup>48</sup> and at the end of Griendel's 1687 book *Micrographia nova*, Griendel recommends Zahn's book in strong language: »Hochgeehrter Leser/ich recommendire allen und jeden der Optik, und Gläser-Kunst Liebhabern/das edle Werck Reverendissimi Patris Joannis Zahn, Ordinis Praemonstratensis und Professi in Ober-Zell bey Würzburg in Francken gelegen/und zwar den dritten Theil *Oculus artificialis*, welcher allen Kunst-Verständigen in der Welt grosse Satisfaction geben wird.«<sup>49</sup>



Figure 10

45 Will, *Nürnberg Gelehrten-Lexicon*, Vol. 4, S. 122.

46 Inge Keil, *Augustanus Opticus. Johann Wiesel (1583-1662) und 200 Jahre optisches Handwerk in Augsburg*. Berlin 2000. (= Colloquia Augustana, Bd. 12.) S. 163.

47 Zahn, *Oculus artificialis*, Vol. 3, S. 234.

48 Ebd., S. 234.

49 Johann Franz Griendel, *Micrographia nova* (Nürnberg, 1687: In Verlegung Johann Ziegers/Büchhandlers), p. 64. Further, we could also cite here again Liesegang's source Georg Andreas Will, who noted in the *Nürnberg Gelehrten-Lexicon* that after Griendel took up his engineering responsibilities in Vienna, he »dabey noch den Liebhabern in der Dioptrik Information gab. Von dergleichen Liebhabern, die es hierinnen bey ihm weit gebracht haben, nennt Hr. Doppelmayer, D. Joh. Georg Volckammern, P. Joh. Zahn, und B. Benzen.«

We can now definitively reorganize the precise chronology of Liesegang's article: Griendel, appearing in Nürnberg in 1670, began manufacturing optical instruments the next year, including the magic lantern. Sturm clearly knew the magic lantern and Griendel through their mutual fellowship through Volckamer, and exhibited one of Griendel's lanterns in his lecture at Altdorf, which was then illustrated in his *Collegium curiosum*. Johannes Zahn, the most significant reporter on the lantern up to 1686, also got much of his information and material (we do not really know yet just which elements) from Griendel.<sup>50</sup> At this point, we have not only brought Griendel into the foreground as the most significant of the three figures whom Liesegang discusses in terms of the history of the magic lantern, but can also identify Griendel as the probable source of a separate tradition of lantern construction, the horizontal cylindrical lantern, that originated in southern Germany early in the 1670s and lasted for just under half a century.

This reorganization raises some interesting new questions. If the tradition of lantern building that Griendel began was one that faded from the repertoire of instrument makers by the 1720s, when did it begin? Kohlhans calls Griendel the inventor of the magic lantern, a statement that Liesegang is quick to dismiss. Liesegang had, after all, recently published major articles on the discovery of the magic lantern, its early exhibition, and its relationship to shadow plays and the camera obscura.<sup>51</sup> But Liesegang also carefully proves in his article that the magic lantern was clearly a new instrument in southern Germany in the 1670s, and also effectively proves that Walgenstein never exhibited his lantern in Germany. Was Kohlhans correct in naming Griendel as the inventor of the magic lantern, at least in so far as he made an independent, if somewhat later, discovery than Huy-

50 It is perhaps worth mentioning here that Griendel is noted throughout Zahn's work (see, for example, the comments and references at Bd. 3, S. 40, 134, 200) while Sturm is not: either Zahn thought he had all of the necessary information from his friend and former teacher, or he took Griendel's side of whatever argument lay between Griendel and Sturm. To Zahn, Sturm is clearly only a bystander and not significantly involved with the magic lantern.

51 See, for example, F. Paul Liesegang, »Die ältesten Projektionsanordnungen«, in: *Central-Zeitung für Optik und Mechanik, Elektrotechnik und verwandte Berufszweige* (Berlin, 1918), Bd. 39, No. 35, S. 345-7 und No. 36, S. 355-6; F. Paul Liesegang, »Die Laterna Magica bei Eschard: Projektionstechnische Erörterungen vor 250 Jahren«, in: *Photographische Korrespondenz* (Wien & Leipzig, 1918 [November]), No. 698, S. 348-52; F. Paul Liesegang, »Die Beziehung des Schattenspiels zur Erfindung der Laterna Magica«, in: *Illustrierte Wochenschrift über die Fortschritte in Gewerbe, Industrie und Wissenschaft* (Leipzig, 1919), Bd. 30, No. 1553, S. 345-48; F. Paul Liesegang, »Christian Huygens und die Erfindung der Zauberlaterne. 1, Die ältesten Nachrichten über die Laterna magica; 2, Die Vorgeschichte«, in: *Deutsche Optische Wochenschrift*. (Berlin, 1919), S. 152-54 & S. 165-67; F. Paul Liesegang, »Der älteste Projektionsvortrag«, in: *Photographische Industrie* (Berlin, 1919) No. 4, S. 39-40; F. Paul Liesegang, »Schaustellungen mittels der Kamera obscura in früheren Zeiten«, in: *Optische Rundschau* (Neukölln, 1919), Bd. 10, S. 385-86, 401-2, 413-14; F. Paul Liesegang, »Laterna Magica und Blendlaterne: Eine geschichtliche Studie«, in: *Rundschau für Installations- Beleuchtungs- und Blechindustrie* (1919), Nr. 1.

gens and Walgenstein? It is clear from the fact that Griendel could send Leibniz a list of some 25 optical instruments at the end of 1671 that he brought his knowledge of optics, and much practical experience, with him to that city when he arrived in 1670. Where did Griendel acquire his skills? When he was a Capucine monk bearing the name Father Ladislaus and moving between monasteries at Salzburg, Würzburg, Kitzingen, and Munich? What was Griendel's contribution to the work of Zahn? Was there some other figure in southern Germany who passed on the magic lantern to Griendel?

It is possible that there was. And that there could be some even earlier accounts of the magic lantern yet to be found. Although it is not especially expressed in this particular article, Liesegang based his idea of the origin of the magic lantern on a sequence that involved the evolution of mirror and lens projection from Kircher's mirror arrangements through the camera obscura.<sup>52</sup> Liesegang resists considering any other material, a limitation that provides him with his own technological »black box« and turns his historical account into one of those histories where »tracing minute changes in clock escapements or cast-iron bell designs over time ...[is] ...too neat, too enclosed and abstracted from history's turbulence.«<sup>53</sup> One result of Liesegang's consciously chosen limitation is that there is very little discussion in any of the magic lantern literature of the history of lamps, lighting, and illumination. So I leave you now with a glimpse of one very tantalising object made in southern Germany sometime between 1637 and 1640, by the eminent Augsburg instrument maker Johann Wiesel (1583-1662). This is a ship's lantern made by Wiesel for the King Christian IV of Denmark, and survives at the Schloß Rosenborg, Copenhagen.<sup>54</sup> Built as a horizontal cylinder, with a concave mirror at the back and a single biconvex lens at the front, it also has the rosette or »crinkle-top« chimney that became a standard magic lantern design, and a fixture for the placement of a candle mid-way between the mirror and the lens. Wiesel was the preeminent instrument maker of his generation in Augsburg, but unfortunately despite a modern and thorough scholarly study of his work,<sup>55</sup> there is no evidence that he made magic lanterns. There is, however, evidence that he was interested in optical projections and effects, and evidence as well that he was interested in multiple lens instruments, since he probably produced the first microscope with a field lens about 1650.<sup>56</sup> Would it real-

52 Here, see the articles above in Anm. 51, and also Herman Hecht's comments on Liesegang in his *Pre-Cinema History* (Anm. 20), No. 15F, S. 12-13.

53 John M. Staudemaier, »Rationality versus Contingency in the History of Technology«, in: Merrett Roe Smith and Leo Marx, eds, *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, 1994: MIT Press), S. 261-262.

54 Photographs of this ship's lantern are in Inge Keil, *Augustanus Opticus*, Abb. 14, S. 392 and Abb. 29, S. 402.

55 Ebd.

ly take twenty years or more for this instrument to acquire one more lens and be transformed into a magic lantern? There has been little work done on this type of ship's lantern, so relevant in design and even partly in function to the horizontal cylinder lantern of southern Germany. »No technology is ever completely understood«, wrote John Staudenmaier. »Technological knowledge is only a partial understanding of the characteristics of real-life artifacts and processes.«<sup>57</sup>

Thank you.

56 In a letter of 22 September 1628 Wiesel wrote to Prince August of Anhalt that »Also hierauff daß ich einen modum erfunden, die Landschafften in ain Zimmer sehr groß zue reflectieren v. fürzustellen«, most likely referring to a room-sized camera obscura, and later in the same letter notes that he also offers a »grossen Proportionalspiegel gar schon lustig v. Gerad aufsteendt an aine gegenversteende Weiß wandtt oder ainer großen Tafel Pappier Zum Abreißen oder Mahlen werffen kan, so sehr nutzlich Diese beeden grossen stugk so beisammen sein müessen, Ist der nechste kauff 30 Taler.« See ebd., S. 455.

57 Staudenmaier, *Technology's Storytellers*, S. 107.