

## **Magic lantern shows through a macroscopic lens: Topic modelling and mapping as methods for media archaeology**

### **Abstract**

This article explores trends across Lucerna, an online web resource, by combining two digital approaches: topic modeling and geospatial mapping. Topic modeling identifies words that occur most frequently together in a large corpus of texts through a form of statistical analysis. Using this method, I studied 2,000 descriptions of magic lantern shows given in between 1874 and 1903. While there were records from Canada, India, and New Zealand in this data set, most of these lantern shows occurred in England. The groupings of words, or “topics”, reflected the prevalence of the Church Army, Band of Hope, and Sunday Schools in Lucerna’s textual record. Mapping these patterns revealed that descriptions of magic lantern shows were relatively uniform across the UK, suggesting that magic lantern shows in urban and rural spaces were represented similarly in periodical literature. Since the topics did not vary by region, I studied how the most prevalent topics differed by host organization and how they changed over time. Descriptions of lantern shows given by evangelistic organizations shared vocabulary with those hosted by Sunday Schools and temperance societies. Individual terms like “friends”, “tea”, “dissolving”, and “interesting” appear in descriptions of lantern shows given by the Church Army, Sunday Schools, and the Band of Hope. Placing these terms in within a topic reveals that these terms appear in different combinations depending on the organization hosting the lantern show. For example, “friend” is statistically more likely to occur alongside “interesting” and “dissolving [view]” in an educational context than in a description of a show given by the Church Army. The fact that evangelistic shows tended to avoid the language of entertainment reflects earlier

discourse about the magic lantern on the mission field. Missionaries like David Livingstone emphasized the usefulness of the lantern in their published accounts of their lantern shows, yet their journals and diaries often foreground the value of the lantern as an entertainment. The decline in topics related to Sunday Schools over time corresponds with the rise of educational lantern lectures, particularly those given by secular institutions like the Royal Albert Memorial Museum. Yet, the inheritance that these secular shows inherited from their precursors in the Sunday School is preserved in the inclusion of “Chinese” in a topic describing Frederic Rowley’s lectures at the RAMM. Although Rowley never presented a lecture on China, descriptions of his shows resemble the geographical lectures given the Church Army and in Sunday Schools with the assistance of Newton and Company’s “China and the Chinese”. This study suggests that topic modeling can be used to excavate the performance history of lantern shows by foregrounding latent linguistic similarities in published descriptions of these events.

**Keywords:** magic lantern shows, missionaries, digitisation, digital humanities, textual analysis, data mining, topic modeling, LDA, mapping, geographic information systems, database design

*The magic lantern introduces us to new friends*

*On Tuesday night at the National Schools, by the kind permission of the Vicar of the parish, who had a visit from Capt. Grummett, who gave us a very interesting lecture on the Church Army work with the aid of his magic lantern. The C. A. is not at work in this village, but to those who assembled to hear the lecture it was very interesting to know that such a society exists (Gassick et al 1894).*

This short passage from *The Church Army Gazette* exhibits all the hallmarks of a published report of a magic lantern show in late-Victorian England. The description offers few details concerning the lantern show's content except that it was a "very interesting" representation of the Church Army's missionary activities. Rather than describing the lecture's content in more detail, the account focuses on the show's context instead. Subtle praise for the vicar showcases local support for the Church Army's work, and the article celebrates Captain Grummett's efforts to visit villages previously unreachable by the evangelistic society by emphasizing the interest elicited by the lantern show. In this endeavor, the magic lantern registers as more than an "aid" that projected images while Captain Grummett spoke. The account gestures to the lantern's value as a tool for visual education and as a vehicle for building social networks, for lanterns created an opportunity for members of the Church Army and the National Schools to meet and learn about each other's work.

Sources like this one have often played a supporting role in histories of the moving image. Print materials document the development of early screen technologies, their global distribution, and their use in performance. These sources range from eyewitness accounts in periodicals to lecture scripts to advertisements and manufacturer's catalogs. Archaeologies of the cinema, particularly as performed by C.W. Ceram and Laurent Mannoni, often pair texts with extant examples of thaumatropes, phenakistoscopes, magic lantern slides, and cameras in order to trace the mechanical evolution of moving image technologies. The creation of Lucerna,<sup>1</sup> a database of magic lantern slides

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<sup>1</sup> Lucerna is now hosted by the University of Exeter: <http://lucerna.exeter.ac.uk/index.php>

and ephemera, and its subsequent expansion through the ‘A Million Pictures’ Project has made it possible to study magic lantern shows on an unprecedented scale.<sup>2</sup> In addition to over 38,000 images of lantern slides, Lucerna contains 2,007 accounts of magic lantern shows, each approximately 100 words in length.<sup>3</sup> Lucerna’s underlying structure and its inclusion of paratextual information like dates, locations, and host organisations facilitate an analysis of overarching trends on both a microscopic and macroscopic level. In this article, I combine two computational approaches—topic modeling and mapping—with close readings of sources as a means to study the social context of magic lantern shows and their representation in textual sources. Topic modeling uses a form of statistical analysis to identify words that frequently appear together whereas mapping via geographic information systems visualizes patterns in spatial data. I will show that both techniques provide considerable advantages for future studies of the magic lantern, and can lead to new insights concerning patterns of lantern use, particularly when used in conjunction with Lucerna’s rich metadata. Although this study will focus on magic lantern shows given in Britain, it also provides a methodological framework for future studies of lantern shows on a global scale.

In addition to exploring topic modeling and mapping as valuable methods for media archaeology, this article uses these approaches to make provisional claims about the role of periodicals in shaping nineteenth-century perceptions of lantern lectures. Magazines edited and published by religious organisations played a significant role in establishing and reinforcing the magic lantern’s

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<sup>2</sup> For more information regarding ‘A Million Pictures,’ see <https://a-million-pictures.wp.hum.uu.nl/>.

<sup>3</sup> The resulting corpus of 210,620 words is comparable in length to Joseph Conrad’s *Heart of Darkness*. The computational approaches I will adopt are more often associated with much larger corpora, but even with a relatively small body of text, these digital methods reveal latent patterns in the narrative strategies contained in the texts.

reputation as an educational tool. The wide geographic distribution of linguistic patterns will reveal that the location of the lantern show had little influence on the vocabulary used to describe the event. Instead, narrative strategies in published accounts tend to vary depending on the organisation describing the lantern show. Nuances in narrative style are especially noticeable in the ways that evangelistic organisations, temperance societies, and scientific institutions represented the content of their shows and their audiences in print.

This methodology exemplifies a mode of media archaeology that focuses not on the mechanical evolution of screen-based media but on the technologies that mediate our view of the magic lantern's global history. These span from analog forms of publication, to transcriptions of these texts, to database structures, to data visualization. Placing these technologies as part of a continuum exposes the ways that published accounts serve as both records of lantern shows and representations of their social context. This double function is embedded in the digital remediation of patterns and trends through statistical analysis and data visualization. As part of an ecology of mediating technologies, I suggest that tools for computational analysis of text are best understood as macroscopic lenses that enlarge (and potentially distort) facets of the magic lantern show.<sup>4</sup> Like Capt. Grummett's magic lantern, macroscopic lenses "aid" analyses of textual material by creating visualizations which, in turn, frame subsequent narratives about the material that these views represent. As is true of their

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<sup>4</sup> The vocabulary of macroscopy stems from Matt Jockers characterization of computational approaches as macroanalysis. He describes the computer's role as a 'tool that assists in the identification and compilation of evidence' (2013, 30). Jockers offers a robust account of the underlying processes which generate macroscopic views of a corpus, a model which I will emulate here.

optical counterparts, these computational macroscopic lenses must be accompanied by a robust account of their powers of magnification in order to understand precisely what they show.

### ***Remediating accounts: preparing for computational analysis***

Far from being a purely mechanical process, computational approaches to Victorian texts rely on editorial interventions at each stage of the process. By discussing the techniques that I used in detail, I foreground how editorial choices made during digitisation and data manipulation shape subsequent analyses of popular visual culture and performance media. In this case, the process was particularly complex due to the intricate structure of a collaboratively-authored magic lantern database and by the fact that I would be analyzing information through multiple modes of digital analysis. As I will demonstrate, digital remediation of textual sources requires both precision and flexibility, especially when grappling with uncertainty and ambiguity in Victorian representations of magic lantern shows. This negotiation occurs in three stages: creating entries for texts in databases such as Lucerna, extracting information about lantern shows represented in these texts, and preparing the extracted entries for further analysis. Each of these phases builds on previous editorial interventions, some of which were made long before these records were digitized, and becomes a multilayered process of mediation that reflects the affordances of preceding technologies.

This layering of mediating technologies is further compounded by the fact that eyewitness accounts in print are already several steps removed from the nineteenth-century lantern show. As cultural critic Fredric Jameson has argued, works of art (and by extension, pieces of performance art) are ‘mediated’ in that they are viewed through a matrix which includes the viewer’s personal experience

and cultural context (1981, 39). Eyewitness accounts ossify the author's own biases and interests, making it impossible to fully extricate the author's perspective from the sequence of events described in the text. Furthermore, translating magic lantern shows into a textual medium inevitably—and irrevocably—loses facets of the lantern show as a multi-sensory and embodied experience. Nineteenth-century editorial practices, particularly those adopted by evangelistic organisations, further limit our view of the magic lantern show. In the case of London Missionary Society periodicals, published eyewitness accounts preserve missionaries' vocabulary, but judicious editors also excise moments of interaction with the audience or technical malfunctions.

These editorial practices were also performed by the missionaries themselves. David Livingstone's published narratives offer one such moment of self-censorship. In *Missionary Travels and Researches in South Africa* (1857), his account of his first expedition into Central Africa, Livingstone recounts a particularly lively series of public addresses given with the aid of an improved phantasmagoria lantern in Kololo country in late 1853:<sup>5</sup>

It was pleasant to see the long lines of men, women, and children winding along from different quarters of the town, each party following behind their respective head men.

They often amounted to between five and six hundred souls, and required an exertion

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<sup>5</sup> At this time, the Kololo kingdom extended along the Lozi flood plain in what's now northern Botswana and southern Zambia. The Kololo, a seSotho-speaking people, was one of the many ethnic groups who fled South Africa in response to the Mfecane, a period of warfare and massacres surrounding Shaka Zulu's effort to expand the Zulu kingdom. In 1840, the Kololo conquered the Lozi and other Africans who lived in this area. The Kololo were particularly eager to support Livingstone's expedition as a means to expand trade networks with the Atlantic coast and to protect the western border of their kingdom, and so, furnished with Kololo provisions, Kololo men and key Lozi vassals joined Livingstone's expedition as guides and translators. These lantern shows took place in Sesheke and Linyanti. One of Livingstone's lanterns now resides at the David Livingstone Birthplace Museum in Blantyre, Scotland. His slides have yet to be located.

of voice which brought back the complaint for which I had got the uvula excised at the Cape. They were always very attentive; and Moriantsane, in order, as he thought, to please me, on one occasion rose up in the middle of the discourse, and hurled his staff at the heads of some young fellows whom he saw working with a skin instead of listening. My hearers sometimes put very sensible questions on the subjects brought before them; at other times they introduced the most frivolous nonsense immediately after hearing the most solemn truths (pp. 235-236).

In this version, Livingstone attributes his vocal strain to projecting his voice (as well as images) in order to instruct a large crowd, but his field journal suggests a different source for his “complaint.” He writes:

The last two nights brought such a concourse of women and the pictures so loosened their tongues it was only occasionally I could get in a word of explanation. Tonight they propose to make Mapulanyane stand with a switch and keep them off, but I object, and hope milder measures will be effectual in preserving the peace.<sup>6</sup>

The diary suggests that the audience’s responses to the projected images were so prolific that they risked undermining the pedagogical function of the lantern show. Despite his initial reservations about using brute force to limit the audience’s participation, Livingstone had become so exasperated that he eventually accepted help from Kololo men to regulate crowd walla. When compared to journal entries

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<sup>6</sup> *Livingstone’s African Journal 1853-1856*, Isaac Schapera, ed., Chatto & Windus, 1963, p. 18.

authored during this series of lantern lectures, the account in *Missionary Travels* simultaneously emphasizes the size of the Kololo audience and silences them. By foregrounding his own voice, Livingstone emphasizes his labor and his efforts to downplay the apparent inefficacy of the lantern as an educational tool. As we will see through topic modeling, this technique resonates with the narrative strategies adopted by evangelistic organisations in England. The resulting account in print is most accurately characterized as a representation of the magic lantern show, one which tells us something about show itself in relation to the perspectives of the author and his readers. As transcriptions of these texts, Lucerna entries that contain quotations of published accounts like Livingstone's offer a window through which to study the representation of magic lantern shows in periodical literature and their cultural context. Crucially for macroanalysis, Lucerna also provides details about the date of the lantern show, its location, and host organisation in machine-readable (and thereby computationally analyzable) form.

To find accounts of lantern shows and supporting data about these events in Lucerna and to extract this information for further study, one must first map out the structure of the underlying database itself. Lucerna stores metadata about the events described in texts as well as quotations from published accounts as a series of tables with rows and columns, much like a series of interrelated spreadsheets. Each of these tables focuses on an aspect of magic lantern shows, including the people mentioned in textual sources, organizations who hosted lantern lectures, and the locations of specific performances. Since this study focuses on the connections between different facets of the database, I identified relevant tables and their connections to each other. Figure 1 visualizes the tables examined in this study and their relationship to each other through their primary keys, often referred to as the

Lucerna ID.<sup>7</sup> These connections are not immediately apparent through the public-facing version of the database, but they appear as hyperlinks to other entries on the website. Searching multiple tables simultaneously is not yet possible through the website's search interface, but complex searches are possible when using Structured Query Language, or SQL, to work with the database in its native form.<sup>8</sup> SQL queries yielded 2,262 records of magic lantern shows in 2,213 locations; 1,160 of these events were hosted by one of 402 organisations. The textual records tended to represent temperance societies and evangelistic societies, but there were also scientific institutions like the Royal Albert Memorial Museum in Exeter described in the Lucerna database as well. Most of these entries had been added by Richard Crangle before and during *A Million Pictures*. While there were reports of lantern shows from New Zealand and Canada, records focus on England, a reflection of the project's British roots. The corpus spans the golden age of the lantern as a mass medium, beginning with the increasing portability of camera equipment in the 1870s through the rise of film in the 1920s.

Before I could analyze these search results using computational approaches, I had to translate this information into digital forms better suited for topic modeling and mapping. Rather than mirror

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<sup>7</sup> This form of storage is called a relational database. In this kind of database, primary keys serve as a unique identifying number. For a more detailed description of SQL and transcriptions of the queries used in this study, please consult Appendix A: An introduction to Lucerna's SQL available via Indiana University's institutional repository: <http://hdl.handle.net/2022/24394> I created Figure 1 created using Lucidchart, a free, web-based tool for building flowcharts.

<sup>8</sup> For security reasons, the SQL database that powers Lucerna can only be accessed by Richard Crangle and server managers at the University of Exeter (and formerly, of the University of Trier). To avoid compromising the security of the database, Richard created a copy of Lucerna sans images for me to study. Due to the size of the database, it was more sensible to use a supercomputer than my personal laptop, so I set up my copy of the database on Indiana University's research database complex with the assistance of Kalani Craig. This strategy also prevented accidental changes to Lucerna, for additions, deletions, and corrections made to the database through Trier's or Exeter's servers would immediately appear on the website.

the complexity of the database, I exported the search results as spreadsheets and streamlined the seven tables from Lucerna into three tables that contained the following information:<sup>9</sup>

- Quotes from texts that describe magic lantern shows with bibliographic information about the source (tblkeywordlink + tbltext)
- Information about the date and location of the lantern show (tblevent + tbleventaddress + tbladdress)
- Information about organisations who hosted events (tblorganisationevent + tblorganisation)

Simplifying the structure of the database for purposes of this study made it easier to expand and refine Lucerna entries for my own research and for potential future studies. Throughout this process, I preserved the Lucerna ID (the primary key) for each record. This strategy not only enabled me to compare patterns across different facets of the database, but it also laid the groundwork for these expanded entries to be reunited with Lucerna. Representing descriptions of lantern shows as three tables also foregrounds different genres of editorial tasks needed for a multi-method computational study of magic lantern shows.

The table containing quotes formed the core material for textual analysis. To prepare these accounts for topic modeling, I verified that all quotes were indeed quotes by sorting the texts from shortest to longest; this process exposed 255 records that were short summaries instead of transcriptions of Victorian and Edwardian texts. Since these entries did not help me answer my research questions about the vocabulary used to describe lantern shows in nineteenth-century print

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<sup>9</sup> This simplification made it easier to topic model the texts and to map overarching trends, but I would not necessarily recommend simplifying the database as a whole, especially since the tables in this study are linked to others that require this level of complexity.

culture, I did not include them among the texts that I topic modeled. This process also included regularizing typographical details (like dashes and currency symbols) and corrected typos using Microsoft Excel's find-and-replace tool. I transformed the table that contained quotations from primary sources into individual text files for topic modeling, preserving both the the text ID and the event ID so that I could correlate patterns in the textual descriptions of lantern shows to their location and host organisation.<sup>10</sup>

To trace patterns across the 402 organisations represented in this corpus, I had to develop a more detailed classification system to describe the hosts of these magic lantern shows. Thanks to the accuracy of the transcription, the names of local branches of nationwide organisations were preserved in the Lucerna record, including 86 iterations of the Church Army. Other organisations, like the Grimsby and District Sunday School Union, only appear once and do not seem to be part of larger networks. Grouping these organisations into categories balances regional complexity with shared institutional ties. Although there is a field in Lucerna to describe the type of organisation, not all of them had been categorized. For the purposes of this study, I kept “temperance organisation” as a category and added new ones. Sunday schools and branches of the Church Army both fell under the shared heading of “religious organisations”; I divided this category into “evangelistic organisations” and “Sunday Schools” to foreground differences in their purview. Where possible, I added

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<sup>10</sup> This task was done computationally using a php script that Kalani Craig wrote for Mac and that I modified for PC. This script in both Mac and PC form is included in Appendix B on topic modeling, available via Indiana University's institutional repository: <http://hdl.handle.net/2022/24394>. Currently, Lucerna assigns a primary key to each text but not to each quote. For example, “The Church's Holy War” in the *Church Army Gazette* contains 834 descriptions of lantern shows. Individual volumes of the *Gazette* have unique ID numbers. Since 670 of those volumes describe two or more texts, I needed both the text ID and the event ID in the file name in order to correlate topics with other features in the data set.

denominational affiliation so that I could compare the representation of Anglican magic lantern shows to those sponsored by congregationalist and dissenting organisations.

As for the locations referenced in these letters, I needed to remediate addresses of lantern shows into machine-readable form before visualizing them through mapping tools. This editorial process of geolocation involved both batch processing and more artisanal approaches. First, I divided Lucerna's geocoordinates column into two: one for latitude and one for longitude. Of the 2,213 locations, less than 1% had coordinates in decimal degrees. The locations associated with magic lantern shows had varying degrees of specificity, ranging from only the name of the village to the name of the building and the building's street address. To accommodate this uncertainty, I assigned each entry a numeric value from 1 to 4, 1 being absolutely certain that the event occurred in this building and 4 indicating that the event occurred within a ten mile radius. This enabled me to filter out locations with a low degree of certainty when examining trends on a regional or city level. For coordinates for villages, I used a free batch geocoding tool that searches Google maps for coordinates.<sup>11</sup> Since villages typically cover less than a five mile radius, this technique produced results within the range of accuracy that I needed to map trends on a global and nation-wide scale. The remaining locations could not be reliably batch georeferenced on a contemporary map, despite the fact that approximately 20% of them had a street address. This was in part due to rapid urban development in the 20th century, to damage that occurred to the buildings during the 1940s, and to the demolition of many churches in the 1970s. To georeference these locations, I adopted methodologies from genealogy and studies of regional lantern

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<sup>11</sup> The tool can be accessed here: <https://www.doogal.co.uk/BatchGeocoding.php> I chose this tool because I could monitor the results in real time, identifying errors early in the process.

shows.<sup>12</sup> Using a combination of these methods, I was able to assign geographic coordinates for all but 57 entries, 2% of the original total.<sup>13</sup>

Locating relevant Lucerna entries, extracting them, and expanding this dataset in preparation for textual analysis and mapping exposes the degree of editorial work needed to refine information from Lucerna for computational approaches. These interventions foreground the gap between the kinds of information that we can glean from late-nineteenth-century primary sources and the level of specificity required by geospatial mapping tools.<sup>14</sup> If presented uncritically, the macroscopic view offered by the resulting map of lantern shows and linguistic patterns would seem to offer a greater degree of precision than what the primary sources afford. Assigning a numeric value which corresponds with a defined geographic radius not only accounts for uncertainty in the map but also serves as an example of how to represent this uncertainty, even as this information is processed quantitatively through a macroscopic lens.

Unlike mapping, topic modeling takes uncertainty into account by offering a probabilistic view of overarching trends. As a form of statistical analysis, topic modeling exposes latent linguistic patterns in a large corpus of text by identifying clusters of words, or ‘topics’, that are most likely to

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<sup>12</sup> Like Lucerna, most publicly-accessible genealogy resources are peer-refereed. For example, GENUKI (UK and Ireland Genealogy) includes a large gazetteer of historic locations of churches and parishes. My Primitive Methodists is a similar resource created and maintained by the Englesea Brook Chapel and Museum of Primitive Methodism. For regional histories of magic lantern shows, I drew from John Plunkett and Joe Kember’s presentations at the AMP workshop in Exeter in January 2018 by examining newspaper and municipal records.

<sup>13</sup> In addition to 57 unlocatable addresses, there were also 58 reports that described a series of lantern shows. The locations and dates of these shows were unknown, making them too ambiguous to map. However, I did include them in the texts that I topic modeled because they helped me study the vocabulary used to represent shows in print.

<sup>14</sup> Lucerna has mechanisms in place for exposing editorial interventions, namely by distinguishing between names of slides and sets found in primary sources and names given by the author of the Lucerna entry. This study extends A Million Pictures practices by creating fields that capture degrees of certainty.

appear together. Given the relatively small scope of the corpus, I used Andrew McCallum's MALLET, an open-source and open-access topic modeling tool, to process the texts (2016).<sup>15</sup> MALLET expresses probability on both a macroscopic and microscopic scale. Figure 2 offers a conceptual map of topic distribution across the entire corpus by representing word frequencies and correlations as part of a matrix. This overarching view of the corpus is divided into three columns: a number that identifies the topic, the percentage of the corpus in which that topic is likely to appear, and the words that are most likely to co-occur in these documents. Because the number assigned to each topic is not related to its distribution or its content, they have been reorganized in Figure 2 to place the most prevalent topics at the top of the matrix and the least at the bottom. The most prevalent topic, which contains markers of a religious meeting, reflects the fact that most of the documents describe lantern shows given by evangelistic organisations in a church setting. The terms within a topic are organized from the most frequently used to the least. After experimenting with different numbers of topics, I limited the topic model to 25 topics of 8 words each and refined these topics by setting the optimization interval to 10.<sup>16</sup> On a more granular level, MALLET creates a similar matrix for each document, making it possible to identify the most prevalent topics in each description of a magic lantern show. This matrix revealed that most of the accounts had a strong correlation to one topic. For the purposes of this study, I used

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<sup>15</sup> MALLET generates topics via latent dirichlet analysis, a Bayesian form of latent semantic analysis developed by David Blei (2012). Scott Weingart and Ted Underwood offer robust introductions to topic modeling and its underlying mathematical principles. While Voyant and the GUI version of MALLET also use LDA to topic model, there is no way to set the random seed on which the process starts, making it impossible to repeat results. Appendix B, available via Indiana University's institutional repository: <http://hdl.handle.net/2022/24394>, provides the code used to divide quotations from primary sources into individual documents, MALLET commands, and the stopword list used in this study.

<sup>16</sup> Commonly used words like 'the', 'and', or 'of' do not appear in the topics thanks to a stopword list. Without this filter, articles would displace more meaningful patterns due to their frequency in the documents. For this project, I added organisation names and common locations to the stopword list because they were represented in paratextual information. Appendix B contains an extended list of these terms.

Excel's index function to identify the most prevalent topic for each document and then added this top topic to the table that contained accounts of lantern shows and their supporting bibliographic information. I then added information about the host organisation and location of the lantern show to this table to map the geographic distribution of linguistic patterns using Carto. The topics underlined in Figure 2 will be the focus of the analysis which follows.

### *Mapping a 'hop' topic*

Topics with lower densities, like 'hop-pickers' in Topic 14, offer an opportunity to understand how computational approaches identify the content and context of the lantern show. At first glance, the view offered by the macroscopic lens in Figure 2 suggests that topic modeling can distinguish between types of lantern shows based on their description in print, for the individual terms in this list gesture to settings (parish, school, open-air), content (dissolving [views],<sup>17</sup> Chinese, life,<sup>18</sup> birds), and epiphenomena (tea, music, collection). There are also topics which cluster around individual lecturers, including Fredrick Richard Rowley of the Royal Albert Memorial Museum (Topic 13) and Frank Adkins from the Band of Hope (Topic 19).<sup>19</sup>

Topics with lower densities seem to identify specific contexts; this is particularly the case for Topic 14 which contains agricultural terms (fruit, hop-pickers, seed, sown, pickers). The Church

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<sup>17</sup> 'View' and 'views' were included in the stopword list since 'dissolving' is so frequently followed by 'view'. Future studies might eliminate the space between these two words so that the topic model will treat them as a single unit.

<sup>18</sup> "Life" usually refers to a biopic of an individual ('life of Martin Luther') or a travel narrative which focuses on the quotidian ('London life').

<sup>19</sup> The topics also reference Alfred Oliver Rowden and Dr. Dr Reginald Vaughan Solly of the RAMM (Topic 17 and several officers from the Church Army: Captain William Davey (Topic 22), Captain Morris (Topic 4), Captain Clark (Topic 11), Captain J.W. Wood (Topic 3), and Captain and Lieutenant Coleman, who were brothers (Topic 21).

Army often gave lantern shows during the hop-picking season in September and October. Urbanites flocked to the fields for a working holiday, and the Church Army saw an opportunity to evangelise during harvest.<sup>20</sup> Figure 3 maps the geographic distribution of this topic, represented as triangles, against the backdrop of all the events described in the corpus, the circles.<sup>21</sup> The rural setting of most events described by this topic reflects the agricultural context of the Church Army's magic lantern shows. The relatively wide geographic spread was unexpected in light of other studies that have used a similar method, particularly Michael Gavin and Eric Gidal's map of topics in the gazetteers and topographical dictionaries of Scotland. In their study, a topic related to the textile industry (which included 'manufacture, linen, employed, looms, trade, cotton') produced a clustering around Glasgow and Clyde in the west of Scotland and Tayside and Fyfe in the east, all centers of textile production in the nineteenth-century (2016, 191). Given the geographic specificity of their results, I was surprised to see such a scatter-shot pattern here.

In order to make sense of this distribution, I turned to the 24 primary sources that were most representative of this topic. While the topic model had identified almost all instances of hop-picking in the corpus, it also included descriptions of lantern shows that were not tied to the harvest. Instead, the topic model conflated instances of literal harvesting and agricultural metaphors for evangelisation, in part due to the editor's penchant for puns. A description of a hop-gardens lantern show in October 1896 that appeared in the *Church's Holy War* makes this connection plain:

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<sup>20</sup> This tradition continued until the 1960s when the agricultural industry became more commercially oriented.

<sup>21</sup> The map included here was created using Carto, a geographic information system that is free for students through GitHub. Since Carto limits the amount of analysis that you can perform, I had to further simplify the dataset into a single spreadsheet. Appendix C on mapping contains a more detailed description of this process:

<http://hdl.handle.net/2022/24394>

As the Captain [Drabble] makes his way through the [hop] gardens, dropping the seed wherever opportunities present themselves many have accounts to tell of the good impressions made by the Magic Lantern. It is indeed true Missionary work. God grant that the seed sown many produce a fruitful harvest.<sup>22</sup>

This passage maps Jesus' metaphor for the mission field as 'white already to harvest' onto agricultural spaces in rural England, thereby mediating locations that hosted lantern shows through a Biblical lens.

This 'hop' topic challenged the assumptions that I was making about the extent to which linguistic patterns reflected the location of the event. Further explorations of topics via the map revealed that there were no discernible regional patterns for the topics in this corpus. Instead, the map emphasizes the pervasiveness of religious and temperance lantern shows in late-Victorian Britain in both rural and urban settings. While social reformers and missionaries are well-represented in Lucerna, their contributions to screen history and the moving image are just beginning to surface in scholarship on screen culture.<sup>23</sup> The map not only shows where and when lantern shows were given but how these events were represented. Because the texts in this corpus were drawn exclusively from print sources, the wide geographic distribution of topics suggests that periodicals, particularly those edited and published by their respective societies, played a central role in disseminating and reinforcing narrative tropes that described lantern shows in print.

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<sup>22</sup> From the *Church Army Gazette*, 24 October 1896, p. 6. . Lucerna record: <http://lucerna.exeter.ac.uk/event/index.php?language=EN&id=7000413>

<sup>23</sup> This increased attention to temperance shows and lantern lectures of social reform is thanks in large part to scholars affiliated with A Million Pictures and Heritage in the Limelight. *Screen Culture and the Social Question, 1880-1914*, edited by Ludwig Vogl-Bienek and Richard Crangle, and Martyn Jolly's essay on "Soldiers of the Cross" serve as examples of this work in print, though the presentations at A Million Pictures workshops and other essays in this double issue of *Early Popular Visual Culture* have continued these conversations about religious and temperance material.

### *Time for Tea: Reading topics through Lucerna's metadata*

Because the most prolific organisations in this corpus, the Church Army and the Band of Hope, produced multiple magazines and journals, the most effective means to trace subtle nuances between descriptions of lantern shows was to categorize them by organisation. I was particularly interested in the topic model's creation of three separate topics (24, 8, and 15) that described annual Sunday School soirees, Christmastide entertainments for scholars, teachers, and parents that often included tea and dissolving views. Given the high volume of texts in the corpus which describe these kinds of events, I was not surprised that they were represented in multiple, prominent topics, nor was I surprised to see that this topic had a global distribution, for one of the lantern shows in New Zealand describes an annual Christmas party. All three topics use shared vocabulary to describe epiphenomena (tea), the audience (friends, scholars, children, teachers, vicar), and the content of the show (entitled, dissolving). For clarity, I created a Venn diagram of the top five topics associated with each organization (Figure 4) rather than visualize the relationships between topics, textual accounts, and organizations as a network analysis.<sup>24</sup>

This visualisation exposes distinctions among organisations that were not visible in the topic model by itself. Descriptions of magic lantern shows published by evangelistic organizations avoid the language of visual spectacle. Rather than cast lantern shows as an entertainment, accounts of the Church Army's magic lantern shows emphasize the religious context and content of the show. The

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<sup>24</sup> This illustration was created with Adobe Illustrator. While presenting these through a more computationally driven visualization is possible, a Venn diagram is the most legible representation of overlapping topics.

presence of the vicar in written representations of lantern shows legitimizes the use of projection equipment as an evangelistic tool. While vicars often were driving forces for temperance and education, they appear most prominently in topics relating to evangelistic organisations. As a church leader, the vicar symbolizes local support and validation for national evangelistic societies like the Church Army. The most prevalent topics for evangelistic organisations also foreground the labor of the lanternists. The earnestness of the lanternists is seen in both their lectures (addresses, visit) and in their use of the lantern to project (thrown, shown) slides depicting the life of Christ (life, Christ, Jesus). ‘Few could listen to the earnest gospel appeals of these young servants of Christ without feeling the necessity of a change of heart,’ states one such description from the *Church’s Holy War*. The article continues by asserting that scenes from the “Life of Christ” were also most interesting and instructive’.<sup>25</sup> By contrast, topics shared by Sunday Schools and Temperance Societies include references to special effects—dissolving views— and explicitly describe them as “entertainment.”

The extent to which organisations influenced the narrative strategies of print is apparent in the description of Captain Grummett’s lantern show at the beginning of this article. The account portrays the lantern show as a joint meeting between the Church Army and the National Schools. The most prevalent topic for this text, Topic 2, is not among the top 5 for either evangelistic organisations or Sunday Schools, suggesting that the presence of another organisation influenced the narrative strategies that were used to represent this event in a Church Army periodical.

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<sup>25</sup> From the *Church Army Gazette*, no. 700 (1901), p. 6.

### *Topic Modelling as a method for identifying unexpected contexts for lantern use*

Thanks to the pervasiveness of Sunday School soirees and the proliferation of accounts concerning these in periodicals, the magic lantern show never fully shed its reputation as an entertainment for children. The magic lantern had become so strongly associated annual soirees by the 1890s that when the Royal Geographical Society wanted to purchase a projector of its own, one of the members objected by calling the lantern a ‘Sunday School treat.’<sup>26</sup> Fortunately, these misgivings were not heeded, and a lecture hall was built specifically for lantern-aided lectures. The popularity of the geographical lantern show is reflected in the wealth of lantern slides in the Royal Geographical Society’s collection as well as geographical and scientific lectures in the Manchester Museum and the Royal Albert Memorial Museum in Exeter, aspects of which are made available through Lucerna.<sup>27</sup> The topics surrounding Alfred Rowden, Fredric Rowley, and Reginald Solly—three members of the Royal Albert Memorial Museum Field Club (RAMFC) —seem to distinguish these lectures from Sunday School Soirees while also reflecting the ways that the geographic lectures incorporated elements of natural science.

In particular, the lectures given by Alfred Rowden infused travel narratives with images of botany, zoology, ethnography, and geology.<sup>28</sup> On the eve of April 2, 1921, Rowden presented one such lecture, entitled

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<sup>26</sup> As quoted by James R. Ryan in *Picturing Empire*, 193.

<sup>27</sup> On RGS collections, see Emily Hayes, ‘Slidescapes: Three Royal Geographical Society lantern lectures by Vaughan Cornish,’ *Early Popular Visual Culture* 17:1 (2019), pp. 71-88.

<sup>28</sup> Rowden was also a keen ornithologist, as evidenced by his lantern lectures on birds and the presence of ‘bird’ and ‘species’ in Topic 17. *Proceedings of the College Field Club and Natural History Society: 1929-1930* (Exeter: University College of the South West of England, 1930), p. 4

'Notes in Mesopotamia and Persia,' illustrated by a large number of lantern slides made from photographs taken by the lecturer when serving in Asia during the war. Many of the slides depicted subjects of natural history & river life, approach of a sandstorm, features of the plains of Mesopotamia and of the mountains of Western Persia & while others depicted towns and villages and their inhabitants (1928, 10).<sup>29</sup>

Equally, Solly's lepidoptery lectures took on a local flavor through their focus on moths and butterflies of Devon, as did Fredric Rowley's lantern lectures on microscopy, zoology, and natural history. We can also find evidence of this type of mixed generic description within other commercial slide sequences, suggesting that this was a common principle within lantern culture more generally. More importantly, Rowden's 'Notes in Mesopotamia and Persia' speaks to the ways that lantern lectures represented local cultures and peoples. In their respective histories of photography, James Ryan and Jack Thompson have foregrounded the role of the lantern show in disseminating images which reinforced British rule, particularly within late-nineteenth- and early-twentieth-century Britain. Local inhabitants are either elided in sweeping panoramic views of the countryside or portrayed as ethnographic curiosities in photographs that display their clothing. Ryan argues that geographic lectures drew from the visual vocabulary and narrative style of missionaries who presented photographic images of evangelical efforts abroad. Thompson offers a sustained analysis of one such show, "Congo Atrocities," created by John and Alice Harris to advocate for humanitarian aid. What's remarkable is that topic modeling identifies the inheritance that geographic lectures received from

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<sup>29</sup> The slides from this lecture, now part of the Royal Albert Memorial Museum's collection, have been digitized through A Million Pictures. They are accessible here: <https://www.slides.uni-trier.de/set/index.php?id=3008611>

earlier missionary accounts not through their shared visual content but through shared tropes in representations of these events.

The inclusion of 'Chinese' in a topic that describes Rowley's lantern shows reveals that this cluster of words tends to refer to geographic lectures based on the lecturer's experience of a particular area. The term 'Chinese' in Topic 13 refers to a set entitled 'China and the Chinese.'<sup>30</sup> A version of this lantern lecture manufactured by York and Son was included in the Church Army's catalogue of lectures and was part of evangelistic lanternists' repertoire. According to one report in *The Church's Holy War*, a Captain who had been a missionary to China gave his lantern lecture in Chinese dress and even sang hymns in Chinese.<sup>31</sup> Like Rowden's lecture on Mesopotamia and Persia, each version of this set contained images of architecture, landscape, customs and dress. The sequence of images that depict tea production moves from a panoramic view of a village in Fujian or Zhejiang in eastern China to views of workers curling, picking, winnowing, sifting, and packing tea. The framing of these photographs, which do not crop the bodies of the workers, serves a dual purpose in that it emphasizes labor required to prepare tea for export and offers an ethnographic display of Chinese dress. The collocation of lectures on Chinese culture and on Devonshire natural history in Topic 13 suggests that

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<sup>30</sup> A partial copy of this set from the Manchester Museum has been digitized thanks to A Million Pictures: <http://lucerna.exeter.ac.uk/set/index.php?id=3000862> There is also an example of a partial set in the Church Missionary Society Collections at the University of Birmingham that is interspersed with photographs taken by a missionary while in China.

<sup>31</sup> *Church Army Gazette*, no. 714 (1901), p. 6. Lucerna record: <http://lucerna.exeter.ac.uk/event/index.php?language=EN&id=7000911>

personal narratives tended to be described as “interesting,” second only to the interest generated by the dissolving view.<sup>32</sup>

Mapping topics related to Rowden, Rowley, and Solly further exposes the connection between accounts of missionary lectures abroad and geographic lectures. In theory, topics related to these three lecturers should be geographically limited to Exeter or in locations that are not affiliated with a religious organisation. According to the primary sources included in this corpus, these lecturers never presented a lantern show in a rectory, and yet, the presence of ‘rectory’ as a term in Topic 17 places Rowden and Solly’s lantern lectures in the same location as those sponsored by evangelistic organizations.

### ***Beyond Lucerna: Considering evidence from unpublished missionary sources***

This approach to written accounts of magic lantern shows can be used to study written sources in any language thanks to the way that topic modelers process words. As more sources are added to the database, it will become possible to see if the results described above are extrapolable to global trends. In the case of evangelistic societies, this method has suggested that periodical literature standardized the vocabulary used to describe lantern shows given in Britain, regardless of their location. There is also evidence to suggest that magazines and missionary biographies produced by the London Missionary Society and the Church Missionary Society played an equally important role in disseminating and reinforcing the assumption that the lantern functioned as an effective evangelistic

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<sup>32</sup> Topic 9 lists “delivered,” “interesting,” and “dissolving” as its most frequent words. This topic has a higher distribution than the Topic 13 on Rowley’s lectures. This is, in part, a reflection of the limited number of textual sources describing events at the RAMFC when compared to accounts of Church Army.

tool on the mission field. Unlike the periodicals studied above, editors of missionary society journals and quarterlies preserved the language used by the missionaries themselves, meaning that shared vocabulary was not the work of a single editor. The fact that missionaries adopted the language of other accounts of magic lantern shows suggests that periodicals created a feedback loop. As a mediating technology, print was responsible for amplifying, disseminating, and confirming the lantern's reputation as a tool for both education and evangelisation.

This dynamic is especially apparent in an account of celebrated missionary to the South Pacific, John Williams' lantern show, which is not presently included in Lucerna's database of textual sources. A posthumous biography of the celebrated missionary to the South Pacific quotes a letter from Williams to his son describing a magic lantern show that he gave in Tutulia in January 1839. In response to an image of Christ on the cross, 'there was a general sobbing,' wrote Williams, his audience's 'feelings were overcome, and they gave vent to them in tears.' This moving account of the lantern show reached Coimbatore, India. Inspired by this account, William Addis, a fellow London Missionary Society missionary, wrote to the foreign secretary requesting 'a superior magic lantern, something of the sort Mr. Williams procured for his use in the South Seas.' His letter then requests slides of scriptural events and figures produced by Philip Carpenter, London's leading slide manufacturer. Addis was not the only member of the London Missionary Society to be following activity in the South Seas closely. David Livingstone must have known of the warm reception that Williams received among the Samoans because he recognized a similar pattern among Kololo reactions to white men in Africa. 'They [the tribes north of Kuruman] know nothing of the gospel & consequentially form neither a good nor bad opinion of it,' he wrote in a letter to Joseph Freeman; 'in

many respects we occupy the same position with respect to them as some of our missionaries have with the South Sea Islanders.’ While there is no evidence that Livingstone read the published account of Williams’ lantern shows, Livingstone makes repeated requests for lantern material following the publication of William’s biography, and not before. In his account of his first missionary journey, Livingstone characterizes his lantern as ‘a good means of conveying, instruction’ (1857, 266) and an instrument ‘which we found of much use’ (1857, 250)

Field diaries, journals, and letters written by missionaries complicate the representation of the lantern show in print, suggesting that it would be useful to incorporate these more extensively into databases such as Lucerna. Unpublished sources rarely describe conversion experiences precipitated by the lantern, and they often contain information excised in the published account. As we have already seen in the case of David Livingstone, unpublished accounts of lantern shows often represent the ways in which lanterns functioned as a technological novelty.

#### Implications for future studies of magic lantern shows and performance media

As in the case with Livingstone, what is lost in the process of mediation is a view of the audience, for the audience of Livingstone’s lantern shows often included several different ethnic groups, not all of whom would be considered indigenous to the part of Africa in which he found them. Similarly, the audience present in lantern shows given in Britain are flattened into broad categories of ‘friends’, ‘scholars’, and ‘people’. Mapping topics challenged my assumptions about the extent to which the audience influenced the representation of magic lantern shows in print. If audiences gave lantern shows a distinct local flavor, that contribution was not present in the printed accounts of the lantern

show. For this reason, future studies should consider topic modeling both published and unpublished accounts of magic lantern shows to differentiate narrative strategies deployed in public-facing representations of lantern shows and private ones.

Exposing how topic modeling and mapping mediate our view of nineteenth-century lantern shows sheds light on the ways in which computational approaches are very like the magic lantern show itself. As a technology, the lantern enlarged images from the slides that had been pre-selected by the lanternist, offering a view that was not possible without the mechanical act of projecting. What made lantern shows like Captain Grummett's "very interesting" was not only the visual content of the slides and the subject of his lecture but also the meeting of two organisations afforded by the event. Textual records ossify the process of selecting images, projecting them, and providing a narrative to accompany them and offer an account of the social interaction that took place when these facets were brought together in the context of a lantern show. As an archaeology of mediation, this article has excavated the layers of mediating technologies which shape our view of the nineteenth-century magic lantern show, spanning from unedited eyewitness accounts to their edited counterparts in periodicals to their digital transcriptions in databases such as Lucerna to their representation in topic models and maps and finally to their appearance as supporting evidence in this article. By placing mediation at its core, a robust account of editorial interventions goes beyond representing technology as an 'aid' to media archaeology. Topic modeling and mapping offer a mechanical process by which to enlarge patterns within this corpus. While the view offered by these macroscopic lenses reflects the limited perspective of the texts they project, topic modeling and mapping play an integral role in creating a narrative about nineteenth-century lantern shows. This union of text, technologies, and analysis is only possible

through the networks created by projects such as A Million Pictures, the sociability of its contributors, and the technologies which support continued collaboration. Thanks to Richard Crangle, Lucerna's architect, the database's underlying architecture offers a robust framework through which to study magic lantern shows on a global scale. I, for one, am very interested to see how this shared resource introduces us to new friends in the years to come.

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### *Figure Captions*

Figure 1: A map of Lucerna's relational structure through primary and foreign keys

Figure 2: MALLET-generated topics sorted most to least frequent

Figure 3: Geographic distribution of Topic 14 ('hop-pickers')

Figure 4: Venn diagram of the top five topics for each organization