DOI: 10.32703/2415-7422-2024-14-2-513-538

UDC 771.319.4:778.5: 792.9:93/94

Liudmyla Vaniuha
Ternopil Volodymyr Hnatiuk National Pedagogical University
2, Maxyma Kryvonosa Street, Ternopil, Ukraine, 46027
E-mail: Ludmyla_vanyuha@ukr.net
https://orcid.org/0000-0003-0851-0067

Mariia Kyreia
Ternopil Volodymyr Hnatiuk National Pedagogical University
2, Maxyma Kryvonosa Street, Ternopil, Ukraine, 46027
E-mail: mariaganych@gmail.com
https://orcid.org/0000-0001-5872-9839

Natalia Lemishka
Ternopil Volodymyr Hnatiuk National Pedagogical University
2, Maxyma Kryvonosa Street, Ternopil, Ukraine, 46027
E-mail: teatr.kaf@gmail.com
https://orcid.org/0000-0003-3337-2145

Olena Spolska
Ternopil Volodymyr Hnatiuk National Pedagogical University
2, Maxyma Kryvonosa Street, Ternopil, Ukraine, 46027
E-mail: olenadovbush84@gmail.com
https://orcid.org/0000-0002-2397-2035

Iryna Patron
Ivan Franko National University of Lviv
1, Universytetska Street, Lviv, Ukraine, 79000,
Kyiv National I. K. Karpenko-Kary Theatre, Cinema and Television University
40, Yaroslaviv Val Street, Kyiv, Ukraine, 01054
E-mail: iryna.patron@lnu.edu.ua
https://orcid.org/0000-0002-1357-8325

History of the evolution of cinema in the context of considering the stages of development of science and technology. The first steps to the birth of cinema

Abstract. *Historiographic works on the history of cinema play an important role in preserving knowledge about the development of this art form. They not only document the key stages of the evolution of cinema, but also provide an opportunity to analyze it as a cultural phenomenon that is closely intertwined with the history of mankind. Historiographic works on the history of cinema cover the study of the development of cinema as an art, a means of communication and an industry. They reflect various aspects of its formation: socio-cultural influences, technological breakthroughs, genre transformations and the role of cinema in a historical context. However, a thorough analysis of historiographic sources on the study of the history of the evolution of cinema in the context of considering the stages of the development of science and technology has not been carried out before. The aim of the study is to investigate the state, completeness and reliability of the study of the history of the development of cinema in the context of considering the stages of the development of science and technology, based on the analysis of historiographic sources, the achievements of predecessors, and modern methodology. The objective of this article is to analyze historiographical sources that consider the magic lantern, the camera obscura, and the shadow play as key precursors to cinema. The magic lantern, the camera obscura, and the shadow play were key milestones in the development of cinema, as they developed techniques for manipulating light and shadow, creating the illusion of movement, and projecting images. They became important precursors to cinema, providing the conceptual and technical foundations that allowed cinematic technologies as we know them today to emerge. All three devices actively used the manipulation of light and shadow to create visual effects that became the basis for cinema. Each of these devices allowed for technical innovations in the use of lighting, projections, and images that were later adapted in cinematic technologies such as projectors and motion pictures. All of these technologies helped popularize the idea of using optical effects and media for a mass audience, which was important for the emergence of cinema as an industry. Historiographical works devoted to the magic lantern, the camera obscura, and the shadow play focus on the study of these inventions as important precursors to cinema. They laid the foundations of visual art that uses the play of light and shadow, and influenced the development of technologies for creating the illusion of movement.*

Keywords: *birth of cinema; visual effects; magic lantern; camera obscura; shadow play; historiography*

Introduction.

The development of cinema has always been closely linked to the progress of science and technology, since it was technical innovations that created the foundations

for the emergence and evolution of this art. For example, research into human vision, in particular the persistence effect (a residual image on the retina), became the basis for the creation of devices capable of reproducing movement, such as movie cameras and projection devices (Usai, 1996, p. 21; Galifret, 2006; Utterson, 2020). In the second half of the 19th century, the first devices for recording and demonstrating movement were invented, such as Thomas Edison's kinetoscope and the Lumière brothers' cinematograph, which undoubtedly became a technical breakthrough for its time.

The development of optics and precision mechanics allowed the creation of new, more precise optical-mechanical systems and lenses. Thus, the improvement of optical lenses made it possible to shoot clearer and higher-quality images. And the creation of mechanisms for the continuous movement of film made it possible to shoot and demonstrate films without stopping (Betancourt, 2020, p. 27).

Research in the field of acoustics and electroacoustics made it possible to record and synchronize sound with images, which made it possible to introduce sound into cinema. The emergence of sound systems, such as the phonograph and technologies for optical recording of sound on film, made this possible (Zappe, 2020; Dienstfrey, 2024; Slowik, 2024).

The development of chemical science, namely the study of color pigments and reactions, provided the possibility of obtaining color recordings on film (Technicolor, Kodachrome systems), which contributed to the emergence of color cinema (Brown, Street, & Watkins, 2019; Thompson, 2019; Lipton, 2021).

The development of computers and digital cameras opened a new era in cinema and allowed the abandonment of film, which significantly simplified the process of shooting and editing. Computer equipment and technology became the leaders of the digital revolution in the film industry (Alforova, Marchenko, Kot, Medvedieva, & Moussienko, 2021; Hatchuel, & Vienne-Guerrin, 2021; Dun, et al., 2022). Modern software for 3D modeling and compositing created a new dimension of visual aesthetics.

Progress in science and technology also influenced the subject of cinema. For example, science fiction (films like *"2001: A Space Odyssey"* or *"Interstellar"*) show ideas about space, robots and the future, based on modern scientific theories.

Thus, cinema has always developed in close connection with scientific discoveries and technological achievements, which allowed for the improvement of both the technical component and artistic possibilities. Therefore, these aspects have always been in the field of view of historians of science and technology.

Soon after the emergence of cinema, historiographical works on the history of cinema appeared, which sought to record and systematize the achievements of this new art form. In the early stages of the historiography of cinema, these were rather descriptive chronicles. The first works, for example, articles in newspapers and magazines of the late 19th and early 20th centuries, documented the development of

cinema as an invention. These materials focused on technical innovations, such as the use of the kinetoscope or the improvement of film projectors.

In the 1910s, cinema began to be considered not only as a technical achievement, but also as an art form, which contributed to the formation of theoretical approaches. Researchers and critics such as Louis Delluc (Delluc, 1990; Bernabei, 2018; Calvo, 2021; Matti, 2022) and Ricardo Urgoiti (Alonso, 2023; Reyes, 2023; Arce, 2024) began to analyze its artistic potential. Louis Delluc is one of the first film theorists to introduce the concept of "cinematic art".

In the period between World Wars I and II, works appeared that explore the impact of cinema on culture and society. For example, the works of Siegfried Kracauer considered cinema as a social mirror that reflects the collective consciousness of a certain era (Kracauer, 2019).

In the middle of the 20th century, the historiography of cinema moved from individual articles to large-scale systematic studies, which opened the era of systematization of the history of cinema. Researchers began to study the impact of cinema as an industry on society. They considered the role of large film studios, censorship, economic and political factors.

In particular, thorough chronological works stand out. Georges Sadoul wrote one of the first global histories of cinema (*"Histoire générale du cinéma"* multi-volume work, 1946–1954), which covered key periods in the development of cinema. In it, Georges Sadoul focused on technical achievements and aesthetic transformations. In another thorough chronological work, Lewis Jacobs ("*The Rise of the American Film: A Critical History*", 1939) examines the development of Hollywood as the center of world cinema (Stadel, 2014; Slugan, & Terrone, 2021).

At the same time, the studies of that time are characterized by an institutional approach. Thus, André Bazin in his work *("Qu'est-ce que le cinéma?",* 1958) focuses on the analysis of the aesthetics and philosophy of cinema. Douglas Gomery ("*The Hollywood Studio System"*, 2017) considers the study of Hollywood as an industrial system.

Studies began to appear that examined specific genres, such as science fiction, westerns, and film noir, which allowed for a better understanding of the evolution of forms and themes in film.

Cinema began to be studied as a means of reflecting social change, ideologies, and cultural identity. For example, Siegfried Kracauer (*"From Caligari to Hitler: A psychological history of the German film"*) analyzed the influence of German cinema of the 1920s on the formation of Nazi ideology (Deaville, 2019; Henkel, 2022; Ponten, 2023). Sergei Eisenstein's work on montage theory became the basis for the analysis of propaganda cinema (Belodubrovskaya, 2018; Santolin & Rigo, 2019; Bulgakowa, 2022; Román Vidal, 2023).

In the second half of the 20th century, interest in cinema outside of Hollywood grew. Studies of European auteur cinema (Jean-Luc Godard, Federico Fellini, Ingmar Bergman) and analysis of cinema from Asian, Latin American, and African countries

(Ritwik Kumar Ghatak, Satyajit Ray, Ossama Mohammed) reached a new level. There is growing interest in studying National Film Schools, particularly regional features of cinema, such as Soviet cinema, the French New Wave, and Italian neorealism.

Since the second half of the 20th century and in the 21st century, the historiography of cinema has become more multifaceted, introducing new approaches. In particular, researchers focus on cultural and sociological analysis when studying the impact of cinema on society and the relationship between cinema and politics, ideology, and social change. Modern researchers analyze the transition of cinema to digital formats, the impact of streaming platforms and new technologies such as VR and AR. Interest in digital technologies, the globalization of cinema, and transmedia narratives is being explored. More and more attention is paid to such aspects of film history as: the role of women in cinema; informal film movements; cinema from countries that have long remained outside global analysis, etc. The works of modern film historians such as Thomas Elsaesser (2004) are devoted to the analysis of cinema in the context of media history; Kristin Thompson, David Bordwell and Jeff Smith (*"Film History: An Introduction"*) to a comprehensive study of the history of cinema.

Many issues remain debatable. For example, the question of what to consider the "beginning of cinema" (Eadweard Muybridge, Thomas Edison or the Lumière brothers). Researchers also consider the role of genre cinema in artistic development in different ways (commerce vs. auteur art).

Historiographic works on the history of cinema play an important role in preserving knowledge about the development of this art form. They not only document the key stages of the evolution of cinema, but also provide an opportunity to analyze it as a cultural phenomenon closely intertwined with the history of mankind. Historiographic works on the history of cinema cover the study of the development of cinema as an art, a means of communication and an industry. They reflect various aspects of its formation: socio-cultural influences, technological breakthroughs, genre transformations and the role of cinema in a historical context. However, a thorough analysis of historiographic sources on the study of the history of the evolution of cinema in the context of considering the stages of the development of science and technology has not been carried out before.

The aim of the study is to investigate the state, completeness and reliability of the study of the history of the development of cinema in the context of considering the stages of the development of science and technology, based on the analysis of historiographic sources, the achievements of predecessors, and modern methodology.

The objective of this article is to analyze historiographic sources that consider the magic lantern, the camera obscura, and the shadow theater as key predecessors of cinema.

Methods of Research.

The study of historiographic works on the history of cinema requires a comprehensive approach, which determines the interdisciplinary nature of this article.

To analyze the evolution of historiographic works in time sequence, the chronological method was used. To do this, we studied how approaches to the analysis of cinema changed in different historical periods.

In order to identify differences in the interpretation of the history of cinema depending on the cultural or regional context, a comparative method was used.

To study works devoted to a specific topic or aspect of cinema, a thematic analysis was used. The goal was to identify how a certain topic is revealed in different contexts and research traditions.

The method of source analysis was used to study the source base on which historiographic works are based. It consisted in analyzing the materials used: archival documents, films, memoirs, technical descriptions and assessing the reliability and representativeness of the sources. This allowed to determine how the selected sources influence the interpretation of film history.

To study the key themes, concepts and categories used in the texts, the method of content analysis was used. This allowed to identify dominant trends, stereotypes or gaps in the study of the history of cinema.

Methodological analysis was also used. It allowed to understand how the methodological choice affects the results of the study and to assess the advantages and limitations of each approach. The research data showed how the methodologies of film analysis changed: from descriptive to structural-semiotic or media archaeological approaches.

The interdisciplinary approach used consisted in combining methods from other sciences (sociology, cultural studies, technical sciences) (Strelko, et al., 2019; Gutnyk, Sklyar, Radohuz, Volosnikova, & Tverytnykova, 2021; Yatskiv, 2022). It was used in order to reveal the relationship of cinema with the wider cultural and technological context.

To analyze historiographic works through the personalities of the authors, the biographical method was used (Pylypchuk & Strelko, 2020; Tverytnykova, Radohuz, & Gutnyk, 2020; Pylypchuk, O. Ya., Strelko, O. H., & Pylypchuk, O. O., 2021; Faust & Németh, 2024;). The study of the influence of historians' personal beliefs and experiences on their work has allowed to reveal the subjective dimension in the interpretation of history.

Thus, the integrated approach used, combining several methods, has allowed to understand historiographical works on the history of cinema more deeply, their strengths and limitations, and to reveal new perspectives in the study of this field.

Results and Discussion.

The first step towards cinema was taken in the 5th century BC, when the *camera obscura* was created. In addition, *shadow theater (shadow play)* appeared even earlier in China and Japan (see Figure 1), and the principle of creating an image using a narrow hole was known even in antiquity. In the 17th century, another important device for projecting images appeared – the "*magic lantern*". The emergence of these three

techniques is a significant stage in the history of the development of cinema at the stage of its inception.

Researchers note that the common factors that unite these devices are the following:

Manipulation of light and shadows. All three devices actively used manipulation of light and shadows to create visual effects that became the basis for cinematography. In cinematography, the use of light and shadows is fundamental to the formation of an image.

Figure 1. Luanzhou Shadow Play (Sun et al., 2024).

Illusion of motion. Each of these devices created or conveyed the idea of the illusion of motion, which is the main feature of cinematography. The magic lantern and the shadow play made it possible to create images that moved or changed, which is key to the development of cinema.

Technical innovations. Each of these devices allowed for technical innovations in the use of lighting, projections, and images, which were later adapted in cinematic technologies such as projectors and motion pictures.

Popularization of the idea of media and optical effects. All of these technologies helped popularize the idea of using optical effects and media for a mass audience, which was important for the emergence of cinema as an industry.

Development of optical concepts and technologies. These devices became important stages in the development of optics and technologies that allowed for the manipulation of images. The development of photography and cinematography is closely linked to the technologies of projection and recording of images, which were the basis of the magic lantern, the camera obscura, and the shadow play.

Historiographical works on the magic lantern, the camera obscura, and the shadow play focus on examining these inventions as important precursors to cinema. They laid the foundations for visual art using the play of light and shadow, and influenced the development of technologies for creating the illusion of movement.

The "magic lantern" for projecting images onto a vertical screen became widely known in the 17th century. In its simplest form, it was a box with a magnifying tube and a lamp inside. Behind this lamp was a reflector, and between the tube and the box there was a gap where a frame drawn in ink was placed (see Figure 2). The images were static. In their works, Georges Sadoul, Eric Barnouw, Laurent Mannoni, Erkki Huhtamo, and Mervyn Heard analyze the technical improvements to the magic lantern that contributed to the popularity of this device in the 18th and 19th centuries. Historians saw the magic lantern as a prototype of the modern projector, which influenced the emergence of cinema.

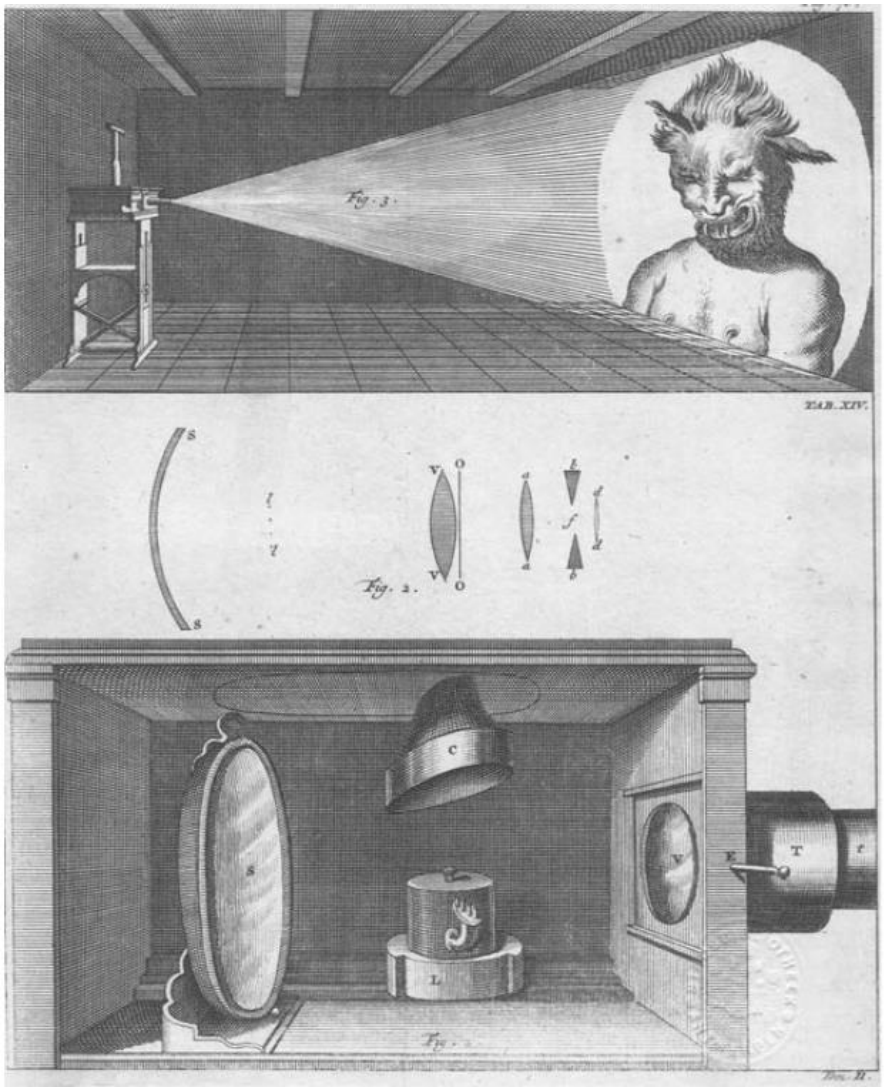

Figure 2. Even's Gravesande's illustration of a magic lantern (1721) (Vermeir, 2005).

Georges Sadoul, a famous French film historian, in his works on the history of cinema, in particular in the fundamental book *"Histoire générale du cinéma"* (1946), mentions the magic lantern as an important predecessor of cinema. He examines this device in the context of the development of visual technologies that preceded the invention of cinema. Georges Sadoul considers the magic lantern to be one of the most important stages in the development of visual entertainment technology. He emphasizes that this device was not only a technical achievement, but also a way to introduce a wide audience to optical effects. This made it a prototype of the cinematic show. Sadoul emphasizes that although the magic lantern could not create real movement, its appearance laid the foundation for subsequent developments that allowed for the imitation of movement in images (through the change of slides or mechanical devices). In his research, Sadoul turns to the phenomenon of phantasmagoria, which was popular in the 18th and 19th centuries. He indicates that such shows were the first experience of collective "cinematic" perception by the audience. Thus, the "magic lantern" created a new format of entertainment, which was perceived as a miracle of the time. Sadoul mentions the contributions of European scientists and inventors, such as Christiaan Huygens, who created the first magic lantern in the 17th century, and Étienne-Gaspard Robertson, who perfected a device for phantasmagoria. Sadoul sees the magic lantern as part of a long journey in the development of the visual arts, including the camera obscura, the shadow theatre, panoramas and dioramas. These inventions, he believes, formed the aesthetic and technical basis for the emergence of cinema. For Georges Sadoul, the magic lantern is not just a technical device, but a key part of history that explains how humanity gradually arrived at the creation of cinema. He sees in the magic lantern not only the technical basis of cinema, but also the first manifestation of mass visual art, which taught the viewer to enjoy stories through images.

Although Eric Barnouw did not focus exclusively on the magic lantern, it is considered in his comprehensive studies of media and film history. His book *"The Magician and the Cinema"* (1981) explores the relationship between early visual media, particularly the magic lantern, and cinema. Barnouw emphasized the role of the magic lantern in combining education and entertainment, and that the device was a precursor to cinematic techniques such as the use of light, projection, and sequential images to convey narratives. Barnouw emphasizes the "magical" nature of the device, its ability to evoke a sense of wonder and fascination in the audience. He connects this to humanity's general attraction to illusion and the desire to bring images to life. Examining the use of the magic lantern in phantasmagoria of the 18th and 19th centuries, Barnouw analyzes its role in shaping ideas about the supernatural, death, and fear. Phantasmagoria, according to Barnouw, was a kind of prototype of the cinematic art, which also often plays on emotions and experiences. Barnouw notes that the magic lantern was the first device that created the possibility of projecting images onto a large screen for an audience, which is the main idea of cinema. Although the lantern did not create real movement, additional mechanisms, such as interchangeable slides or

moving components, made it possible to simulate dynamics. Barnouw sees the magic lantern as an important link between traditional visual arts, such as shadow theater, and technological innovations that led to the emergence of cinema. He emphasizes that the magic lantern laid the foundations not only for the technical, but also for the cultural perception of the ideas of cinema: collective viewing, the use of light to create illusions and the involvement of the audience in the story. Eric Barnouw, like his contemporaries, explores the magic lantern not only as a technical invention, but as a phenomenon that reflects cultural and social notions of reality, illusion, and art. His work is an important contribution to understanding how devices like the magic lantern formed the basis for modern cinema and visual culture in general.

In his book *"Le Grand Art de la Lumière et de L'ombre, Archéologie du Cinema"* (1994), Laurent Mannoni analyzes in detail the role of the magic lantern as one of the key devices that preceded the emergence of cinema. He emphasizes that the magic lantern was not only a technical invention, but also a cultural phenomenon that greatly influenced the development of visual art and the popularization of knowledge. Mannoni considers the magic lantern as a revolutionary device that used the possibilities of light and optics to create images that could be projected onto large surfaces. He analyzes the evolution of the technique, including the use of color slides, moving elements and mechanisms to create the illusion of movement. The magic lantern was a tool for educational demonstrations in fields such as astronomy, physics and biology. Mannoni notes that scientific lectures, accompanied by projections, helped to visualize complex phenomena and make them understandable to a wide audience. The book describes how the magic lantern was used in entertainment performances, religious ceremonies, and even political propaganda. Particular attention is paid to the phenomenon of phantasmagoria, when the magic lantern was used to create the illusion of ghosts and supernatural images. Mannoni argues that the magic lantern laid the foundations of cinematic language: the use of light, projection, editing, and movement. He sees the magic lantern as part of a broader process of development of optical entertainment that culminated in the emergence of cinema. Mannoni's book is important for understanding the magic lantern as part of the history of not only technology but also culture. He connects the device with the evolution of ideas in science, art, and society that paved the way for the emergence of modern cinema.

In *"Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles"*, Erkki Huhtamo examines the magic lantern in the context of media archaeology, viewing it as an important stage in the development of visual technologies that preceded cinema. Huhtamo does not analyze the magic lantern in isolation, but as part of a broader phenomenon – the culture of moving images that existed long before the invention of cinema. He emphasizes that the magic lantern was part of a series of innovations, such as panoramas, dioramas, and other optical shows. Huhtamo applies the method of media archaeology to study how the magic lantern not only functioned as a device, but also interacted with the social, cultural, and economic contexts of its time. He explores how the magic lantern was integrated into various spheres of life –

from entertainment to education. Like Laurent Mannoni, Erkki Huhtamo notes the use of the magic lantern in educational and scientific demonstrations. He pays particular attention to how this contributed to the popularization of knowledge among audiences who did not have access to traditional education. His book gives examples of lectures demonstrating natural phenomena such as volcanic eruptions or solar eclipses. Huhtamo describes in detail how the magic lantern created visual effects that were innovative for the time. The use of color slides, moving elements and narratives formed a multifaceted audiovisual experience. The author considers how the magic lantern influenced the formation of new types of audiences. Visitors to such shows learned to perceive visual narratives, which became important for the future of cinema. Erkki Huhtamo's *"Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles"* is one of the most thorough works in media archaeology, which not only explores the magic lantern as a technology, but also analyzes its role in a broader historical context. Huhtamo emphasizes the importance of the magic lantern as a cultural phenomenon that changed the perception of the possibilities of visual storytelling, ultimately leading to the emergence of cinema.

In *"Phantasmagoria: The Secret History of the Magic Lantern"*, Mervyn Heard (2006) explores the history of the magic lantern, focusing on its use for illusion, entertainment, and audience manipulation. He details both the technical and cultural aspects of the device, focusing on its role in the phenomenon of phantasmagoria. Heard explains how the magic lantern was used in phantasmagoria shows – spectacled performances that created the illusion of ghosts and the supernatural. He examines in detail the productions of such shows in the 18th and 19th centuries, including the work of Étienne-Gaspard Robertson, who improved the projection technique by adding moving slides, changing the size of the image, and other effects. Heard emphasizes the technical aspects of the magic lantern, such as the use of special lenses, multi-layered slides, and moving mechanisms to create the illusion of movement. He also describes how projections could be made onto smoke or translucent screens, which enhanced the "realness" of the images. Mervyn Heard's book examines how the magic lantern was used to create frightening images and embody ideas about death, ghosts and the afterlife. Heard emphasizes that phantasmagoria became popular because it satisfied the audience's need for entertainment that evoked strong emotions. Although the main focus of Mervyn Heard's book is on the entertainment function, Heard also mentions the use of the magic lantern in scientific demonstrations and educational lectures. The author draws parallels between the magic lantern and cinema, noting that the technologies and methods used in projections laid the foundations for future cinema. He argues that the magic lantern educated an audience who learned to perceive stories through visual images. The book "Phantasmagoria" is unique in its genre, as it does not simply describe the magic lantern, but also explores its cultural impact. Mervyn Heard shows how this device was used to manipulate emotions, spread ideas and form new types of entertainment that became the predecessors of cinema. This work is an

important contribution to understanding the role of the magic lantern in the context of media, culture and history.

A camera obscura is an optical device that projected an image of the outside world onto a surface inside a dark room through a small hole (see Figure 3). The idea of a camera obscura is known from antiquity (Aristotle), but practical application developed in the 15th-16th centuries. The term "camera obscura" itself arose in the late 15th century, and the corresponding experiments were carried out by Leonardo da Vinci. The first accurate and complete description of a camera obscura is found in one of Leonardo da Vinci's unpublished works. Venturi, in his work *"Essai sur les ouvrages physico-mathématiques de Leonardo de Vinci"* (published in 1797 in Paris), cites relevant excerpts from Leonardo's work. The medieval Arab scientist Ibn al-Haytham (Alhazen) is considered the first to describe in detail the principles of the camera obscura in his work *"Book of Optics"* in the 10th–11th centuries (Ros, García, Moreno, Romagnoli, & Sebben, 2019; Boudrioua, Chergui, & Rashed, 2020; Maftouni, 2024). He used this device to demonstrate the laws of refraction of light and to study the structure of the visual system. Many film scholars, such as Georges Sadoul, Eric Barnouw, Laurent Mannoni, and even André Bazin, analyze the camera obscura as a fundamental element in understanding visual culture. Film historians see the camera obscura not simply as a technical device, but as a cultural and scientific phenomenon that prepared the ground for the emergence of cinema as an art and technology. Jonathan Crary explores how the camera obscura shaped the visual practices of modernity. Philosopher Michel Foucault sees the camera obscura as a metaphor for the perception of reality and the influence of technology on the formation of worldviews.

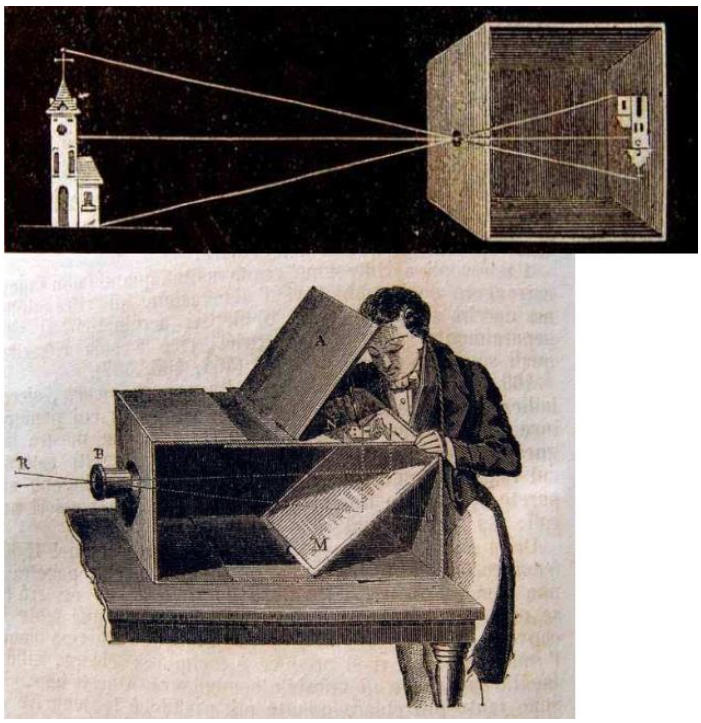

Figure 3. The Camera Obscura (Camuffo, 2011).

Georges Sadoul in his works, in particular in *"Histoire générale du cinéma"* (1946), considers the camera obscura as one of the key stages in the development of image display technologies that preceded the invention of cinema. Sadoul pays attention to its technical and cultural aspects, as well as its influence on aesthetics and the development of fine arts. The camera obscura in the works of Georges Sadoul is considered as a scientific instrument. Sadoul emphasizes that the camera obscura was invented and used for scientific research in the field of optics and the study of the nature of light. It allowed to study the mechanisms of imaging, refraction of light and perspective. Its principle of operation, based on the projection of an image through a small hole in a dark room, became the basis for further technological developments. The camera obscura, according to Sadoul, became an important tool for Renaissance artists, in particular for Leonardo da Vinci. It helped to create realistic images and study perspective, which later became the basis of cinematic framing. Sadoul sees the camera obscura as a precursor to cinema, as it demonstrated the possibility of capturing reality through an optical process. Its technical principle (image projection) was adapted in later inventions such as the magic lantern, photography, and later cinema. Sadoul emphasizes that the camera obscura symbolizes man's desire to "capture" reality and reproduce it in the form of an accurate image. This desire became a key motive for the development of cinema, which he calls the "artificial eye". Sadoul concludes that the camera obscura has a key historical significance, since it became an important stage in technological progress, in particular through its influence on the development of optics and image mechanics. The camera obscura not only prepared the ground for the creation of cinema, but also formed the first ideas about the principles of perception of moving images. Georges Sadoul sees the camera obscura not only as a technical invention, but also as an important cultural and scientific phenomenon that laid the foundations for modern technology and visual art. Its use in science, art, and culture created a solid foundation for the emergence of cinema, which, according to Sadoul, was a logical continuation of this tradition.

Eric Barnouw, in his book "*The Magician and the Cinema*" (1981), draws attention to the camera obscura as an important tool in the development of visual technology and as one of the stages of evolution that led to the invention of cinema. Barnouw examines the camera obscura in the context of its technical, philosophical and cultural significance, emphasizing its impact on the perception of images and the development of media. Barnouw describes the camera obscura as a fundamental invention, as a device that allowed for the creation of accurate projections of reality. Its action, based on the use of natural laws of light and shadow, became the basis for the development of more complex optical technologies, including photography and cinema. Barnouw notes that the camera obscura gave users the first experience of observing "reality", which was transformed into a projection. This became key to understanding the principles of cinema, where the moving image is based on a similar concept of reflecting the real world. Eric Barnouw highlights the role of the camera obscura in art: artists used it to create realistic paintings, and scientists used it to study

the laws of optics and perspective. These applications influenced the technical and aesthetic evolution of images. Barnouw draws attention to how the camera obscura symbolizes the connection between reality and its illusory reproduction. This philosophical aspect became the basis of cinema, where viewers are immersed in the illusion of movement based on real images. Eric Barnouw considers the camera obscura not only as a technical device, but also as a socio-cultural phenomenon. It was popular not only among scientists and artists, but also as entertainment that inspired new ideas in the visual arts. Eric Barnouw emphasizes the role of the camera obscura in the context of media history. Barnouw emphasizes that the camera obscura became the first tool for creating a collective experience of "image contemplation". It allowed not only to see the world in a new perspective, but also to understand it through technical mediation, which is an important feature of cinema. Barnouw sees the camera obscura as a defining stage in the development of media technology and culture. Its impact on artistic reproduction, scientific research and entertainment made this device an important precursor to cinema. For Eric Barnouw, the camera obscura is the beginning of a long history of human interaction with optics, light and images, which ultimately led to the emergence of modern cinema.

Laurent Mannoni (1994), a leading historian of optical technology and author of the seminal work *"Le Grand Art de la Lumière et de L'ombre, Archéologie du Cinema"*, has devoted considerable attention to the camera obscura, considering it a key element in the long history of visual innovation that led to the invention of cinema. Mannoni analyzes this device not only as a technical achievement, but also as a cultural and philosophical phenomenon. Laurent Mannoni describes the camera obscura as the oldest device that allows to recreate reality using the natural principles of light. He emphasizes its versatility and long-standing use in science, art and education. The book states that this invention became the basis for all future devices that work on the principles of image projection. The camera obscura was crucial for Renaissance artists, helping to create accurate images through the knowledge of perspective. At the same time, it was used by scientists to study the properties of light and form an understanding of optical laws. Mannoni emphasizes that the camera obscura symbolized the human desire to understand and "reflect" the world. It became a means of meditation on reality, a way of comprehending the connection between nature, light and man. In the work, he mentions the camera obscura as an example of the first "visual machine", which made it possible to see the world within a frame, similar to a modern cinematographic frame. Laurent Mannoni considers the camera obscura as a precursor to cinema, because it forms an idea of the importance of light in creating an image. And also, because the camera obscura introduces the concept of observing the world through an "artificial window", which later became the basis of cinema. In his book, Laurent Mannoni traces in detail the path from the camera obscura to the magic lantern, photography and cinema, demonstrating how this device contributed to technical and cultural development. For Laurent Mannoni, the camera obscura is not just a technical device, but an epochal invention that has had a huge impact on the development of

visual culture, science and art. Its role in creating optical illusions and shaping a new way of perceiving the world became the basis for the emergence of cinema, which preserves its legacy in its technical and philosophical principles.

André Bazin, a famous film theorist, in his works, in particular in *"Qu'est-ce que le cinéma?"*(1958), analyzes the camera obscura as a conceptual precursor to cinema. Although he does not pay as much technical attention to it as other historians, Bazin uses it as a philosophical symbol for understanding the nature of the image and cinematic realism. Bazin sees the camera obscura as the first step in man's quest for "an objective reflection of reality". According to him, this device embodies the idea of an image that is created automatically, without the intervention of the artist or subjective interpretation. For André Bazin, the camera obscura illustrates the principle of photographic imaging, where reality is conveyed through light, rather than through human intervention. He sees the camera obscura as a tool that reflects reality as it is, without stylization. This correlates with his concept of cinema as a means of "imprinting reality". The camera obscura laid the foundations for the perception of the image as something objective and authentic, which became key to cinematic aesthetics. André Bazin emphasizes the role of light in the creation of images. In the camera obscura, light acts as a "natural artist", forming a picture of the external world. This idea is close to his theory of photography and cinema as "inventions of nature" that serve humanity. For André Bazin, the camera obscura also symbolizes the importance of the "frame" as a means of highlighting a fragment of reality. This is related to the concept of the cinematic frame, which organizes and structures the world for the observer. The camera obscura is, according to Bazin, one of the key stages in human history, when man began to make sense of and document visible reality through technology. It became part of the evolution that eventually led to the creation of cinema as the culmination of these efforts. For André Bazin, the camera obscura is the philosophical and conceptual precursor of cinema. It symbolizes the human desire for objectivity and authenticity in the depiction of the world. Its role in creating an image through light laid the foundations for the theory of cinematic realism, which became central to André Bazin's work and significant for cinema in general.

Jonathan Crary (1992), a renowned cultural and media historian, devotes considerable attention to the camera obscura in his book *"Techniques of the Observer: On Vision and Modernity in the Nineteenth Century"*, considering it not only as a technical device, but also as a key metaphor for understanding changes in perception and philosophical concepts of vision. Crary considers the camera obscura as the dominant model of vision in the 17th and 18th centuries, when it symbolized the idea of objectivity and the detached observer. This device embodied the ideal of a distant, unbiased view of the world, where the observer is outside the events he sees. The camera obscura, according to Crary, was not only an optical device, but also a philosophical metaphor of the Enlightenment era, emphasizing the importance of rational contemplation and the separation of the subject (observer) from the object (reality). Jonathan Crary argues that by the 19th century, the camera obscura as a model

of vision had entered a crisis. The emergence of new technologies such as the stereoscope, together with scientific and cultural changes, led to a rethinking of the role of the observer. He argues that the camera obscura no longer corresponded to new concepts of perception, which emphasized the subjectivity and mobility of the gaze. Crary sees the camera obscura as a precursor to new visual technologies, but at the same time emphasizes that its significance goes beyond its technical impact. It was a conceptual stage in the development of ideas about the way in which humans interact with reality through vision. Crary describes the transition from the static, isolated model of observation symbolized by the camera obscura to the more dynamic and interactive forms of vision that emerged with the development of modern media. For Jonathan Crary, the camera obscura is not only a technical device, but also an important intellectual and cultural symbol. It represents a historical stage in the development of ideas about vision, perception, and knowledge. Crary shows how changing models of observation reflect broader transformations in philosophy, science, and culture that ultimately influenced the evolution of visual media.

Michel Foucault, a renowned philosopher and cultural theorist, although he did not directly study the camera obscura as an optical device, uses it as a metaphor in his work *"L'archéologie du Savoir"* (1969) and other works. He interprets the camera obscura as part of his analysis of power, knowledge, and the ways in which observation and control are organized. Like the camera obscura, which records the world through a limited "frame", power in society structures reality through observation and discipline. In his concept of the disciplinary society, Foucault describes how institutions such as schools, hospitals, and prisons organize space and observation, creating a "visibility of reality". In this sense, the camera obscura is an early example of how technology influenced the formation of knowledge. The camera obscura, which produces an inverted image, is for Foucault a metaphor for how knowledge is often constructed in a distorted, indirect form. This is particularly relevant for the analysis of discourses that he explores in his works. In the context of his critique of the Enlightenment, Michel Foucault sees the camera obscura as a metaphor for the dominant model of knowledge at the time: objective, static, and centralized. He points out the limitations of this approach in the modern era, when knowledge becomes more dynamic and relative. Michel Foucault is often compared to ideas about the camera obscura when he describes the panopticon (an architectural model of a prison that allows centralized surveillance). Both concepts refer to the organization of space where the observer has complete control over what is visible. Michel Foucault does not analyze the camera obscura as a specific invention, but uses it as a philosophical symbol to analyze the structure of knowledge and power. The camera obscura is for him an example of how technology affects the way reality is constructed, creating not only an image of the world, but also a way of understanding and controlling it. The camera obscura in Foucault is a conceptual tool that reflects key aspects of his theory of knowledge and power. Just as the camera obscura determines what the observer sees, so institutional structures determine how society perceives reality. This metaphor helps

to reveal the connection between technology, culture, and the formation of discourses in different historical eras.

Shadow theater, as an ancient art form known in China, India, and other Asian countries since ancient times, spread to Europe in the 18th and 19th centuries (Won & Lee, 2016; Demchenko, et al., 2022; Johnson & Lim, 2022). Shadow theatre: discovering human motion from a sequence of silhouettes. ACM Transactions on Graphics (TOG), 35(4), 1-12.). Its essence is the use of figures that create shadows on a screen with the help of light. Studies of shadow theater often focus on its ritual and cultural aspects, especially in Asian traditions (for example, Indonesian wayang kulit). European versions of shadow theater, such as the performances created by Jean-Eugène Robert-Houdin, are studied as forms of popular entertainment. In works on the history of cinema, shadow theater is analyzed as an early form of visual narrative that influenced the development of editing and lighting techniques. It also attracts the attention of many film historians as a precursor to moving images.

Tom Gunning, a renowned film historian and theorist, sees shadow theatre as an important precursor to cinema, helping to understand early forms of visual spectacle and the role of the viewer in their perception (Gunning, 2009; Gunning, 2017; El Bouayadi, 2023). Although Gunning focuses more on the concept of "attraction cinema", shadow theatre fits into his broader analysis of the development of media and technologies that use light and movement. In his research, Tom Gunning emphasizes that shadow theatre is an example of an "attraction" – a spectacle aimed at visual experience and emotional impact, rather than just narrative. Like early cinema, shadow theatre focused more on creating an immersive visual effect. Shadow theatre demonstrated the ability to manipulate light and form to create optical illusions, which formed the basis of many cinematic techniques, such as the use of light and shadow contrasts, silhouettes and spatial composition. Gunning draws attention to the interactivity of shadow theatre: the viewer became a participant in the spectacle, actively interpreting what he saw. This principle resonates with his concept of early cinema, which invited the audience to directly experience the attraction. Tom Gunning emphasizes that shadow theatre, like phantasmagoria, combined staticity with movement. This created a sense of magic and movement, which later became defining for cinema. Shadow theatre, like early cinema, was a form of "attractions" that focused on visual effect. The development of light and shadow techniques influenced expressionist cinema and the use of optical effects in films. Shadow theatre in Tom Gunning's concept is seen as an important part of the evolution of visual culture, which laid the foundation for cinema as an art of movement and light.

Georges Sadoul considered shadow theatre to be one of the oldest ways of manipulating light and images (1946), creating the illusion of movement, similar to what cinema does. He noted that this art form had much in common with later cinematic techniques, in particular in the way it created visual effects through light and shadow. Sadoul emphasized that shadow theatre developed through the use of various optical technologies, which eventually found their continuation in cinema. One such

tool was the magic lantern, which used light to project moving images similar to those in shadow theatre. Georges Sadoul also noted the aesthetic influence of shadow theatre on the development of visual art. According to him, through the manipulation of light, shadow theatres taught viewers to perceive moving images in a special way. This became the basis for the formation of cinematic traditions, where light and shadow were of great importance in creating atmosphere. Sadoul drew attention to the popularity of shadow theatre in various cultures, from Asia to Europe. He believed that shadow theatre was an important element of folk culture, used for entertainment, education, and religious and mythological narratives. For Georges Sadoul, shadow theatre was an important stage in the development of visual art, which laid the foundation for cinema. He highly valued the technical and artistic innovations of this art form, in particular the use of light, shadow and optical devices, which influenced the development of cinematic practices. Shadow theatre became one of the key elements in the great history of the visual arts that preceded the invention of cinema.

Zenon Walter Pylyshyn, a Canadian cognitive scientist and philosopher of Ukrainian origin, has paid particular attention to the development of early forms of visual art, such as shadow theatre (O'Brien & Opie, 1999; Schröder, 1999; Matthen, 2024). He has analyzed these art forms as important stages on the path to the development of cinema and as part of a broader cultural tradition of optical illusions. Pylyshyn sees shadow theatre as an important part of the evolution of visual technology that preceded cinema. Shadow theatre used the illusion of movement and the creation of images through light and shadow, which became the basis for later cinematic techniques. Zenon Pylyshyn addresses the aesthetic and cultural aspects of shadow theatre, emphasizing its role in folk traditions and popular forms of entertainment, as well as in religious and educational contexts. Pylyshyn emphasizes how this art form has developed and adapted in different cultures around the world. Zenon Pylyshyn also explores the connection between shadow play and other optical devices, such as the magic lantern, and how this contributed to the development of optics and the manipulation of light and images. Shadow play, along with other technologies, became part of the experiments that led to the emergence of cinema. Zenon Pylyshyn was one of those who actively studied the role of optical illusions in the context of cinematic art. He emphasized the importance of early forms of manipulation of light and image in the development of cinema. Shadow play was one of these important stages in this process, where optical devices were used to create effects resembling movement and changes in form. Zenon Pylyshyn considered shadow play as one of the precursors of cinema and an important element in the development of optical effects and manipulation of images. He emphasized how this art form influenced the aesthetics and techniques that later became part of cinema.

The magic lantern, the camera obscura, and the shadow play are considered to be part of the visual culture of their eras, influencing people's understanding of images and their movement. These devices served as means of telling stories, creating the first forms of visual storytelling that became the basis of cinema. Researchers such as

Thomas Elsaesser (2004), using a media archaeological approach, include these devices in the broader context of the evolution of media that preceded cinema.

The magic lantern, the camera obscura, and the shadow play are key precursors of cinema. Historiographical works emphasize their technical, cultural, and artistic impact, viewing these devices as stages in the development of visual media that combined science, art, and technology into a single process that led to the creation of cinema.

Conclusions.

The magic lantern, the camera obscura, and the shadow play can be considered key precursors to cinema, as these devices and art forms played an important role in the development of technologies and concepts that became the basis for the emergence of cinema. The magic lantern, the camera obscura, and the shadow play were key milestones in the development of cinema, as they developed techniques for manipulating light and shadows, creating the illusion of movement, and projecting images. They were important precursors to cinema, providing the conceptual and technical foundations that allowed cinematic technologies as we know them today to emerge.

The magic lantern, the camera obscura, and the shadow play not only laid the foundations for cinema, but also contributed to the development of important scientific and technical concepts. They were milestones in the development of optics, projection technologies, and helped popularize scientific ideas among the public. These devices have become important tools in the fields of media, communications, and the study and development of the physics of light and images, making them significant milestones in the history of science and technology.

Funding.

This research received no external funding.

Conflicts of interest.

The authors declare no conflict of interest.

References

Alforova, Z., Marchenko, S., Kot, H., Medvedieva, A., & Moussienko, O. (2021). Impact of digital technologies on the development of modern film production and television. *Rupkatha Journal on Interdisciplinary Studies in Humanities, 13*(4), 1–11. https://dx.doi.org/10.21659/rupkatha.v13n4.72

Alonso, C. (2023). Copla and Flamenco in Spanish Republican cinema: The cantaor Angelillo and the director Luis Buñuel in the film production company

Filmófono. In L. López Gómez (Ed.), *Popular Music in Spanish Cinema* (pp. 26–40). London: Routledge. https://doi.org/10.4324/9781003194347

Arce, J. (2024). Synchronising voices and shadows: Music and the transition to sound cinema in Spain. In L. Miranda (Ed.), *The Routledge Handbook to Spanish Film Music* (pp. 13–24). Oxon: Routledge. https://doi.org/10.4324/9781003174974-3

Barnouw, E. (1981). *The Magician and the Cinema*. New York: Oxford University Press. Retrieved from https://archive.org/details/magiciancinema0000barn/page/n151/mode/2up

Bazin, A. (1958). *Qu'est-ce que le cinéma?* Paris: Éditions du Cerf [in French]

Belodubrovskaya, M. (2018). The cine-fist: Eisenstein's attractions, mirror neurons, and contemporary action cinema. *Projections, 12*(1), 1–18. https://doi.org/10.3167/proj.2018.120102

Bernabei, M. I. (2018). Un œil nouveau: le Ralenti scientifique à la construction de l'avant-garde. *Cinéma & Cie. Film and Media Studies Journal, 19*(31), 93–115. Retrieved from https://riviste.unimi.it/index.php/cinemaetcie/article/view/16219

Betancourt, M. (2020). *The History of Motion Graphics: from Avant-Garde to Industry in the United States*. Rockville, Maryland: Wildside Press LLC.

Bordwell, D., Thompson, K., & Smith, J. (2010). *Film Art: An Introduction*. New York: McGraw-Hill.

Boudrioua, A., Chergui, M., & Rashed, R. (2020). Arabic Science of Light: The birth of modern optics and of the experimental method. *Europhysics News, 51*(3), 14–16. https://doi.org/10.1051/epn/2020301

Brown, S., Street, S., & Watkins, L. (Eds.). (2019). *British Colour Cinema: Practices and Theories.* London: Bloomsbury Publishing.

Bulgakowa, O. (2022). The present as a trick or the assault on the spectator's psyche: Circus and the Soviet avant-garde. In A. S. Jürgens, & M. Hildbrand (Eds.), *Circus and the Avant-Gardes: History, Imaginary, Innovation* (pp. 37–52). London: Routledge. https://doi.org/10.4324/9781003163749-4

Calvo, Á. (2021). Regulation and business in the origins and development of the mass media: Radio broadcasting in Spain. *International Journal of Business Studies and Innovation, 1*(2), 123–139. https://doi.org/10.35745/ijbsi2021v01.02.0013

Camuffo, D. (2011). *The Camera Obscura and the Vedutas in Venice*. Retrieved from https://www.academia.edu/download/42673445/2011_Canaletto_Camera_Obscura_UK_LR.pdf

Crary, J. (1992). *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century.* Cambridge, Massachusetts: MIT press.

Deaville, J. (2019). Pitched battles: Music and sound in Anglo-American and German newsreels of World War II. *Journal of Musicological Research, 38*(1), 32–43. https://doi.org/10.1080/01411896.2019.1568153

Delluc, L. (1990). Le Silence. In *Ecrit cinématographiques III: Drames de Cinéma, Scenarios et Projets de Films* (pp. 45–50). Paris: Cinématheque Français Cahiers du Cinéma [in French]

Demchenko, O., Kazmirchuk, N., Zhovnych, O., Stakhova, I., Podorozhnyi, V., & Baranovska, I. (2022). Preparing students for the use of theater activities for children's development soft skills: European context. Society. Integration. Education. *Proceedings of the International Scientific Conference, 1*, 31–46. https://doi.org/10.17770/sie2022vol1.6866

Dienstfrey, E. (2024). Making stereo fit: The history of a disquieting film technology. In: *California Studies in Music, Sound, and Media* (Vol. 6). Oakland, California: University of California Press. https://doi.org/10.2307/jj.8543491

Dun, X., Fu, Q., Li, H., Sun, T., Wang, J., & Sun, Q. (2022). Recent progress in computational imaging. *Journal of Image and Graphics, 27*(6), 1840–1876. https://doi.org/10.11834/jig.220061

El Bouayadi, M. (2023). The origins of Moroccan narrative film: Mohamed Osfour's films of the early post-colonial period. *The Journal of North African Studies, 29*(4), 601–622. https://doi.org/10.1080/13629387.2023.2197220

Elsaesser, T. (2004). The new film history as media archaeology. *Cinémas, 14*(2–3), 75–117. https://doi.org/10.7202/026005ar

Faust, A., & Németh, V. (2024). György Barcza–Hungarian diplomat in an era of change: György Barcza's foreign service in Northern Europe between 1916 and 1922. *West Bohemian Historical Review, 14*(1), 67–88. Retrieved from https://wbhr.cz/images/issues/WBHR_2024_1.pdf

Foucault, M. (1969). *L'archéologie du Savoir*. Paris: Gallimard. https://doi.org/10.14375/NP.9782070119875 [in French]

Galifret, Y. (2006). Visual persistence and cinema? *Comptes rendus biologies, 329*(5–6), 369–385. https://doi.org/10.1016/j.crvi.2006.03.008

Gomery, D. (2017). *The Hollywood Studio System: A History*. London: British Film Institute.

Gunning, T. (2009). Invisible cities, visible cinema: Illuminating shadows in late film noir. *Comparative Critical Studies, 6*(3), 319–332. https://doi.org/10.3366/E1744185409000810

Gunning, T. (2017). Shadow play and dripping teat: The night of the hunter (1955). In J. Walters, & T. Brown (Eds.), *Film Moments: Criticism, History, Theory* (pp. 5–7). New Delhi: Bloomsbury Publishing India.

Gutnyk, M., Sklyar, V., Radohuz, S., Volosnikova, N., & Tverytnykova, E. (2021). The formation of computer science centers in Ukraine in the second half of the XXth century. In *2021 IEEE 2nd KhPI Week on Advanced Technology (KhPIWeek)* (pp. 639–643). Kharkiv, Ukraine: IEEE. https://doi.org/10.1109/KhPIWeek53812.2021.9570093

Hatchuel, S., & Vienne-Guerrin, N. (2021). From zones to Zoom: Shakespeare on screen in the digital era. *Cahiers Élisabéthains, 105*(1), 3–13. https://doi.org/10.1177/01847678211008362

Heard, M. (2006). *Phantasmagoria: The Secret History of the Magic Lantern*. New York: The Projection Box.

Henkel, B. (2022). Mabuse Returns: Fritz Lang, 1950s Berlin, and the Afterlife of Nazi Television. *New German Critique, 49*(2), 161–186. https://doi.org/10.1215/0094033X-9734861

Huhtamo, E. (2013). *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles*. Cambridge, MA: MIT Press. https://doi.org/10.7551/mitpress/9228.001.0001

Jacobs, L. (1939). *The Rise of the American Film: A Critical History.* New York: Harcourt, Brace and Company. Retrieved from https://archive.org/details/in.ernet.dli.2015.188482

Johnson, I. C., & Lim, D. (2022). Curating shadows: Malayan shadow puppets in Singapore's Asian Civilisations Museum. *Journal of the Malaysian Branch of the Royal Asiatic Society*, *95*(1), 51–88. https://doi.org/10.1353/ras.2022.0008

Kracauer, S. (2019). *From Caligari to Hitler: A Psychological History of the German Film.* Princeton: Princeton University Press.

Lipton, L. (2021). Two-Color Technicolor. In: *The Cinema in Flux: The Evolution of Motion Picture Technology from the Magic Lantern to the Digital Era* (pp. 423–433). New York, NY: Springer. https://doi.org/10.1007/978-1-0716-0951-4_49

Maftouni, N. (2024). Camera or behind Camera: Ibn al-Haitham vis-à-vis Shaykh Ishraq on Vision. *Journal of Philosophical Investigations, 18*(48), 309–318. https://doi.org/10.22034/jpiut.2024.59157.3630

Mannoni, L. (1994). *Le Grand Art de la Lumière et de L'ombre, Archéologie du Cinema*. Paris: Nathan Université [in French]

Matthen, M. (2024). Object perception: four arguments from philosophy. *Cognitive Processing*, *25*(Suppl. 1), 105–111. https://doi.org/10.1007/s10339-024-01215-y

Matti, F. A. (2022). Photogénie o qué expresa la imagen del cine mudo. *Tábano,* (21), 64–80. https://doi.org/10.46553/tab.21.2023.p64-80 [in Spanish]

O'Brien, G., & Opie, J. (1999). A connectionist theory of phenomenal experience. *Behavioral and Brain Sciences, 22*(1), 127–148. https://doi.org/10.1017/S0140525X9900179X

Ponten, F. (2023). Film und Kino als Spiegel. Siegfried Kracauers Filmschriften aus Deutschland und Frankreich by Viola Rühse. *German Studies Review, 46*(1), 167–169. https://dx.doi.org/10.1353/gsr.2023.0024

Pylypchuk, O., & Strelko, O. (2020). Count A. P. Bobrinsky (1826–1894), the third minister-reformer of railway management in the Russian Empire. *Analele Universităţiidin Craiova. Istorie (Annals of the University of Craiova. History), Year XXV, 1*(37), 7–19. Retrieved from http://www.istoriecraiova.ro/wp-content/uploads/2020/04/2020_1_ANALE.pdf

Pylypchuk, O. Ya., Strelko, O. H., & Pylypchuk, O. O. (2021). Academician V. I. Vernadsky about the originality of life in Space (To the 100th anniversary of his work "The Beginning and Eternity of Life"). *Space Science and Technology, 27*(2), 85–92. https://doi.org/10.15407/knit2021.02.085

Reyes, A. (2023). The Art of Cinema. *Forma, 3*(1), 107–125. Retrieved from https://forma.frb.io/pdfs/Reyes-FORMA-3.1-2023.pdf

Román Vidal, S. (2023). Lights, camera, persuasion!: Sergei Eisenstein, the propagandist filmmaker of the Soviet Union and his ideology (1925–1929). *Revista De Historia, 1*(30), hc341. https://doi.org/10.29393/RH30-13LCSR10013 [in Spanish]

Ros, R. M., García, B., Moreno, R., Romagnoli, C., & Sebben, V. (2019). NASE workshop: Eclipses with models and camera obscura. *Proceedings of the International Astronomical Union, 15*(S367), 176–180. https://doi.org/10.1017/S1743921321000727

Sadoul, G. (1946). *Histoire Générale du Cinema*. Paris: Denoël [in French]

Santolin, C. B., & Rigo, L. C. (2019). Representations of obesity in cinema: The 'Fat Bourgeois' in Eisenstein's Strike (1925). *Movimento, 25*, e25076. https://doi.org/10.22456/1982-8918.91815 [in Portuguese]

Schröder, J. (1999). What has consciousness to do with explicit representations and stable activation vectors? *Behavioral and Brain Sciences, 22*(1), 166–167. https://doi.org/10.1017/S0140525X99431796

Slowik, M. (2024). *Defining Cinema: Rouben Mamoulian and Hollywood Film Style, 1929–1957*. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780197511220.001.0001

Slugan, M., & Terrone, E. (2021). The fiction/nonfiction distinction: documentary studies and analytic aesthetics in conversation. *Studies in Documentary Film, 15*(2), 107–113. https://doi.org/10.1080/17503280.2021.1923141

Stadel, L. (2014). Lewis Jacobs and American film historiography. *Quarterly Review of Film and Video, 31*(2), 180–193. https://doi.org/10.1080/10509208.2011.646157

Strelko, O., Pylypchuk, O., Berdnychenko, Yu., Hurinchuk, S., Gamaliia, V., & Sorochynska, O. (2019). Historical milestones of electrotechnical equipment creation for active experiments in the near-earth space by ukrainian scientists. In *Proceeding's 2019 IEEE 2nd Ukraine Conference on Electrical and Computer Engineering, UKRCON 2019,* (pp. 1229–1234). Lviv: IEEE. https://doi.org/10.1109/UKRCON.2019.8879983.

Sun, L., Li, J., Wang, Z., Liu, W., Zhang, S., & Wu, J. (2024). Research on the redesign of China's intangible cultural heritage based on sustainable livelihood – The case of Luanzhou Shadow Play empowering its rural development. *Sustainability, 16*(11), 4555. https://doi.org/10.3390/su16114555

Thompson, K. M. (2019). The Colour Revolution: Disney, DuPont and Faber Birren. *Cinéma & Cie. Film and Media Studies Journal, 19*(32), 39–52. Retrieved from https://riviste.unimi.it/index.php/cinemaetcie/article/view/16200

Tverytnykova, E., Radohuz, S., & Gutnyk, M. (2020). Research in the field of mathematical modeling of power assets and systems in Ukraine. In *2020 IEEE*

KhPI Week on Advanced Technology (KhPIWeek) (pp. 314–318). Kharkiv, Ukraine: IEEE. https://doi.org/10.1109/KhPIWeek51551.2020.9250180

Usai, P. C. (1996). Origins and survival. In G. Nowell-Smith, (Ed.), *The Oxford History of World Cinema* (pp. 20–30). New York: Oxford University Press. Retrieved from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=337b9626fb7f3b072525a1e70f3bbb999eec736c#page=20

Utterson, A. (2020). *Persistent Images: Encountering Film History in Contemporary Cinema*. Edinburgh: Edinburgh University Press. https://doi.org/10.1515/9781474440745

Venturi, G. B. (1797). *Essai sur les Ouvrages Physico-Mathématiques de Leonardo de Vinci, avec des Fragmens Tirés de ses Manuscrits, Apportés de l'Italie; lu à la Première Classe de l'Institut National des Sciences et Arts.* Paris: Duprat. Retrieved from https://play.google.com/books/reader?id=0iEOAAAAQAAJ&pg=GBS.PP6&printsec=frontcover&output=reader&hl=en [in French]

Vermeir, K. (2005). The magic of the magic lantern (1660–1700): on analogical demonstration and the visualization of the invisible. *The British Journal for the History of Science, 38*(2), 127–159. https://doi.org/10.1017/S0007087405006709

Won, J., & Lee, J. (2016). Shadow theatre: discovering human motion from a sequence of silhouettes. *ACM Transactions on Graphics (TOG), 35*(4), 1–12. https://doi.org/10.1145/2897824.2925869

Yatskiv, Ya. S. (2022). From the history of space research in Ukraine. 1. The performance of space research as of 1991 year. *Space Science and Technology, 28*(4), 78–88. https://doi.org/10.15407/knit2022.04.078

Zappe, F. (2020). In the shadow of the "Indeterminate Speech-Act": The populist politics of rumor in Fritz Lang's early sound films. *European Journal of American Studies, 15*(4). https://doi.org/10.4000/ejas.16481

Людмила Ванюга
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна

Марія Кирея
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна

Наталя Лемішка
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна

Олена Спольська
Тернопільський національний педагогічний університет імені Володимира Гнатюка, Україна

Ірина Патрон
Львівський національний університет імені Івана Франка, Україна,
Київський національний університет театру, кіно і телебачення імені І. К. Карпенка-Карого, Україна

Історія еволюції кінематографу в контексті розгляду етапів розвитку науки і техніки. Перші кроки до зародження кінематографа

Анотація. *Історіографічні праці з історії кінематографа відіграють важливу роль у збереженні знань про розвиток цього виду мистецтва. Вони не лише документують ключові етапи еволюції кіно, але й надають можливість аналізувати його як культурний феномен, що тісно переплітається з історією людства. Історіографічні праці з історії кінематографа охоплюють дослідження розвитку кіно як мистецтва, засобу комунікації та індустрії. Вони відображають різні аспекти його становлення: соціокультурні впливи, технологічні прориви, жанрові трансформації та роль кіно в історичному контексті. Але ґрунтовний аналіз історіографічних джерел, щодо вивчення історії еволюції кінематографу в контексті розгляду етапів розвитку науки і техніки раніше не проводився. Мета дослідження полягає у тому, щоб на основі аналізу історіографічних джерел, здобутків попередників, сучасної методології дослідити стан, повноту й достовірність вивчення історії розвитку кінематографу в контексті розгляду етапів розвитку науки і техніки. Завданням даної статті є аналіз історіографічних джерел, які розглядають магічний ліхтар, камера-обскура та театр тіней як ключові попередники кінематографа. Магічний ліхтар, камера-обскура та театр тіней стали основними етапами у розвитку кінематографії, оскільки вони розвивали техніки маніпуляції світлом і тінями, створення ілюзії руху та проекції зображень. Вони стали важливими попередниками кінематографії, надаючи концептуальні та технічні засади, що дозволили виникнути кінематографічним технологіям, як ми їх знаємо сьогодні. Усі три пристрої активно використовували маніпуляції зі світлом і тінями для створення візуальних ефектів, що стали основою для кінематографії. Кожен з цих пристроїв дозволяв здійснювати технічні інновації у використанні освітлення, проекцій та зображень, що згодом були адаптовані в кінематографічних технологіях, таких як проектори та кінокамери. Всі ці технології допомогли популяризувати ідеї використання оптичних ефектів і медіа для масової аудиторії, що було важливим для становлення кінематографії як індустрії. Історіографічні праці, присвячені магічному ліхтарю, камері-обскура і театру тіней, зосереджуються на дослідженні цих винаходів як*

важливих попередників кінематографа. Вони заклали основи візуального мистецтва, що використовує гру світла і тіні, та вплинули на розвиток технологій створення ілюзії руху.

Ключові слова: *зародження кінематографу; візуальні ефекти; магічний ліхтар; камера-обскура; театр тіней; історіографія*

Received 15.09.2024
Received in revised form 27.11.2024
Accepted 29.11.2024