Available online at:https://ejournal.fah.uinib.ac.id/index.php/khazanah
Khazanah: Jurnal Sejarah dan Kebudayaan Islam
ISSN: 2339-207X (print) ISSN: 2614-3798 (online)
DOI: https://doi.org/10.15548/khazanah.v0i0.70
UIN IMAM BONJOL PADANG
Khazanah
Jurnal Sejarah dan Kebudayaan Islam

MUSLIM & MODERN INVENTORS OF THE CAMERA IN THE HISTORY OF PHYSICS

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Abstract

Camera technology can help support human activities, especially in the digital era. The first Muslim scientist who invented the camera was Ibn al-Haitham, where the mechanism of the way of capturing images is currently also used and applied to become a sophisticated camera with high quality and resolution. This research aims to discover how Muslim scientists' role in discovering camera technology and modern scientists' role in ancient times until this camera technology supports the historical development of physics, especially in optics. This historical research uses secondary data sources through literature. The study's results using the interpretation of data obtained from various references obtained from various relevant references indicate that the invention of the camera was initiated by Muslim scientist Ibn Al Haitham who later modern scientists also improved and developed theory. The application of camera optics to create camera technology that is helpful for life and human activities.

Keywords: Camera, Muslim Scientist, Optics, Physics.

BACKGROUND

The science currently developing is based on what has been in civilization since ancient times. As a human being who has the values of civilization in various scopes, he continues to interact with the surrounding environment and the community to add one benefit and not cause damage everywhere (Islam, 2019) . The civilization of humans can be high when measured by excellence and how conceptual understanding of the existence of the creator by making civilization as a provision to achieve progress in various fields such as agriculture, health industry, transportation equipment, communication tools, architecture, arts, culture, mining, and energy industries and so on (Sindhwani et al., 2022) and includes the branch of cultural science that supports the advancement of various fields of integration (McCauley, 2020) . Civilization certainly has several important figures or so-called vital scientists who are included in it who play a role in finding various solutions to the problems they face (Makarova et al., 2019).

Various inventions or inventions depart from problems to be solved, ranging from small to complex things. Of course, this civilization does not only appear when it has developed in a modern way; since ancient times (Boas, 2021) , it has even been known in the history of Islam; civilization has emerged since the time of Islam developing accompanied by the development of science which is also growing from time to time, and in the end, it goes with the treatise of the spread of Islam which also spread to all parts of the world which were marked by the development of the science of logic

and reason, the discovery of new technology until it entered a period of decline in the Middle Ages (Abdullah, 2020).

The development of the Islamic religion and also the culture that was born with the revelation of the Qur'anic verse which entered a spiritual period lasted thickly until the year 38 Hijriyah, and Islamic civilization entered a period of development and also progress which was marked by being dominated by reason, logic, rationality and also technological thought that humans currently feel. It cannot be separated from the developments and improvements from time to time in various fields, both in terms of the theory, concepts, and technology characteristic of each period of scientific civilization (Tiryakian, 2019) . Over time, various human activities have experienced a decline in terms of the spiritual side, but this is also a civilization with a materialistic nuance, which is very far from the logical basis of science and spirituality (Myers, 2021) . Civilization through a period of health, illness, or ups and downs, built on various elements that give birth to many thoughts of thought in spirit or soul and substance. Mathematically, civilization can be formulated in the sense that civilization is human resources combined with land or natural resources combined with time. The formulation of the problem, in this case, is, of course, the problems faced by humans (Ge & Hu, 2021).

The problems faced by humans are divided into three interrelated elements, and each country has different characteristics of problems and follows the level of education and civilization in one region. It can be ascertained that this is the tail of civilization. Human resources are certainly very supportive of the development of science. One of the points of science that until now holds critical urgency and has an influence on applied science is a branch of science that is more detailed, specifically the branch of physics (Shaw & Shaw jshaw, 2022).

Physics is a branch of science that studies how one object in the universe works and analyzes the causes of motion or phenomena that occur physically. The action and reaction of thing are observed through mathematical formulation (Kilpatrick, 2020) , and of course, this becomes the basis for how this civilization was formed not only involves the development of logic but must also be accompanied by an understanding of life in metaphysics so that the current views are following the times (McElreath, 2020).

Muslim civilization, which is marked by the emergence of Muslim scientists accompanied by accurate contributions in the field of science, especially physics, can be felt since ancient times, and even today, essentially if in ancient times, the purpose of research or study of the new science was to find the truth about science. So currently, existing knowledge continues to be developed so that existing technology can develop better legs and, of course, be improved mechanically or technological developments so that they are increasingly sophisticated or up-to-date even though conceptually continue to develop the basic concepts of thinkers of Islamic scientists at the time (Huang et al., 2019) . Formerly. Islamic scientists who certainly stand out are those who are based on universal monotheism, moderate, and also based on morality. These characteristics certainly strengthen belief and understanding of the majesty of the Almighty Creator of all substances that exist in this world.

Young Muslim intellectuals make all activities related to scientific civilization and Islamic civilization with nuances of worship oriented to the hereafter or divine value in addition to being valuable and related to worldly interests so that various activities carried out take place sacredly in the field of Islamic civilization thought, of course in a balanced manner, which combines Revelation or in the form of existing texts and reason. The reason is positioned as a tool to understand Revelation. Revelation is positioned as a guide to the movement of reason and Islamic civilization that combines the two into one belief, especially in understanding one of the Pillars of Faith, namely the existence of qada and qadar with the obligation to strive for everything that is best for knowledge with The goal is to maintain a balance between the goals of life to achieve the goals of this world and also to live in the hereafter (Munsoor, 2021)

From time to time, Islamic scientists often appear with one of the missions of spreading religious symbols in addition to activities measured by deeds. The study of studies in Islam that gave rise to the Islamic scientific tradition gave rise to the scientific tradition or scientific tradition in which this scientific tradition would conceptually become a schema or the basis for scientific concepts that emerged in a society or civilization and become an Islamic framework that gave birth to a science of science (Sabic-El-Rayess, 2020).

The science of history has urgency in human life to fulfill two essential foundations, namely to meet individual or social needs in understanding identity and the past along with its relationship with other societies and cultures as well as every individual and society both from the past and from the present, so that have a vision or purpose in the way they see themselves in their lives. The vision in question is an awareness to lead people to the actual reality and can be understood by understanding the science of history.

In the history of science in the field of science, including in the field of physics, it must be

understood that the birth of Muslim intellectual figures significantly contributed to the development of technology and became the forerunner of technological developments developed by modern scientists in the middle or even the previous century with various modifications of concepts and theories. Islamic scientists Previously discovered her (Apriani et al., n.d.) . In the field of physics, one branch of physics is the field of optics. The field of optics studies how a physical phenomenon is viewed from an optical phenomenon that involves various physical phenomena involving optics, either naturally or geometrically, and how geometric optics will study light or tools that help human vision. These tools include optical instruments, cameras, glasses, telescopes, microscopes, and binoculars (Minin & Minin, 2021).

The discovery of this development of optical science supports various other scientific developments, such as when telescope technology was discovered; this will support the development of astronomy, which examines how the analysis of phenomena on celestial bodies works through observations of the human senses viewed from the earth by looking at conditions in outer space.

This study aims to examine how camera technology was discovered thanks to the contributions of Muslim scientists and modern scientists with the limitation of the study, namely in the field of camera discovery, namely in the study of physics. Geometric optics, which was explicitly reviewed based on the inventor, continues to develop into the camera that can produce images with clear images and, of course, can be used in various needs that support digital technology today and will continue to grow in the future.

This research only focuses on one field of study that is reviewed so that it will focus more on the discovery of one technology, and for its differentiation, it can be used as an alternative in other research that is relevant to the study of physics and the history of physics related to other branches of physics.

RESEARCH METHOD

The research method used in writing is the historical research method. Historical research is research that aims to be able to understand and interpret events in the past to reach an understanding of insights and conclusions related to events in the past. The data source used is secondary data obtained from reference sources in the form of references in the form of articles from previous scientific research following the topics studied and by analyzing other historical sources, and literature reviews (Xiao & Watson, 2017)

Figure 1 Stages and Steps of Historical Research

1. *Determining the Topic*
   The topic under study is how Muslim leaders and modern scientists can find camera technology that initiates current digital camera technology in a review of geometric optical physics.
2. *Collecting Historical Resources*
   Data sources used as references include written sources obtained from relevant national and international scientific references following the study and scope of science related to the History of developments in Physics.
3. *Verify Historical Sources*
   The verification stage is carried out by checking the validity of the reference sources used so that the quality of the writing can be accounted for
4. *Interpreting Data*
   The interpretation stage is carried out on all historical reference sources that have been previously verified by interpreting information from historical sources obtained. Interpretation is carried out with objective and logical thinking.
5. *Writing History*
   The stages of writing history are carried out as a form of interpretation of research data by writing them down through the results of scientific research that follows the rules and regulations of applicable writing.

RESULT AND DISCUSSION

A. Muslim Scientists in Contribution to Science

Various discoveries at that time were relics of the Abbasid dynasty, the largest in the Arab world and also in the world, namely in the fields of medical Science, astronomy or astronomy, mathematics, geography and history, physics, and coupled with various relics of religious knowledge. The knowledge developing at that time was driven by the spirit of Muslims in studying Science through the guidance of the Qur'an (al-Gharbi, 2021).

The Qur'an has encouraged Muslims to conduct research by looking at the universe, using reason and understanding the secrets spread by Allah in the universe. Things that are encouraged by the Qur'an

in research include looking at and examining how this is a key in running an experiment that is useful for solving a problem in the field of Science (Firdaus et al., 2020). One of the physicists who was the most influential scientist in the field of physics at that time was Al Hasan bin Al Haitsam who died in 430 Hijriyah and with his work in one of his books is al Manazir (Shamey & Kirchner, 2020) . Ibn Haitam also has various other works such as Kitabul Matih fi Tarikhi Asbaniyah, al-Muqtabas fi Tarikhil Andalus, Ma'rifatus Shahabah. Famous books include Kitabul Matih Fi Tarikhil Andalus, Makrifatush Shahabah (Strick, 2020).

B. Islamic Science and Technology Civilization

The progress experienced by Western nations or Europeans has one of the causes that play an essential role through historical facts and based on existing data, namely the development of Islamic civilization. The progress achieved in addition to the fields of science and legal science as well as legislation and social society cannot be separated from the progress of Islamic civilization (Akaliyski & Welzel, 2020) . Long before the Renaissance, which marked the emergence of a rising western civilization, Islamic civilization had for centuries illumined the world with the advancement of science and technology. Western nations use the light from the science of Islamic civilization so that western scientists are born with various technologies to achieve sophisticated technology (Redner, 2020).

The unfortunate thing is that western people do not have the generosity to acknowledge the services of previous Muslim scientists who had built western civilization even though their contributions have been significant in various scientific developments. In contrast, when Islamic civilization and science developed, science did not seem to be covered. However, on the contrary, when the Europeans hold civilization and existing technology, it is covered up as if their contribution was independent of the intervention of previous Muslim scientists.

The golden history of our ancestors as Muslims, which of course is contained in the development of science and technology, we must and should be admired for all the achievements of the western world today, which of course does not make us follow the western culture and do not believe in the abilities possessed by Muslims in the field of science and technology (Rietbergen, 2020) . Science. It is appropriate that the spirit possessed by Muslims must be able to develop the legacy of science, both religious science and year's science, and continue to bequeath outstanding achievements in the fields of science and technology, which are the references for western nations in obtaining a scientific and technological civilization (Leli et al., 2021) that exalted in the eyes of the world with various discoveries in the field of Mathematics, Physics, astronomy, meteorology, geography, geology, biology and to advances in the field of chemistry.

C. Ibn Al Haytham as the most influential Muslim physics scientist

Some of the Muslim scientists who mastered the field of physics were famous and most influential during the Abbasid dynasty, namely Ibn Al Haitham, al-Biruni, and al-Khazini. The research focuses on one of the most influential scientists, Ibn Haitham. Ibn Haitham bin Al Hasan bin Al Haitsam is known as Alhazen in the West. Ibn Al Haitham was born in the city of Basra in 1965 AD, which later grew up in Egypt under the reign of Al-Hakim between 996 AD and 1020 AD—estimated to have died in 1039 AD. Ibn al-Haytham's most significant contribution was to become the most outstanding Muslim physicist of all time, especially in point optics (Elkholy, 2019) . In addition, Ibn al-Haitham was also someone who mastered not only optics but also astronomy, mathematicians, doctors and astronomers. Also, he wrote various commentaries on the theories and opinions put forward by Aristotle and Galileo. The main work of Ibn Al Haitham, entitled Al Manazir, is a work that impacted the development of science in the western world, such as the scientists R Bacon and Kepler (Mehfooz & Shuja Syed, 2020).

The significant progress of the development of science in the west is due to the development of experimental methods that have been developed with various studies, and also the development of the refraction of light that can penetrate air and water and then this perspective can affect the study of objects and materials, how this is the opposite of Previously existing theories expressed from Ptolemy and Euclid in the book by Al Manazir suggested that the action of Light Above the mirror is parabolic and forms a parabola (Taqiyuddin et al., 2020).

Moreover, the scientific method through experiments that Ibn Al Haitham has put forward emphasizes mathematical experiments in obtaining various research results. This makes a very effective formulation known as quantitative studies of empirical and experimental approaches in modern science. The nature of the image formed, the characteristics of the motion of light, the use of lenses, and the camera obscura, which has now developed, were initially studied mathematically by Ibn Al-Haitham and many other basic optical phenomena described by Ibn al-Haitham (Corke, 2022).

D. The History of Invention of Camera Technology

Camera technology currently plays an essential role in supporting various activities. With various purposes, of course, it is very supportive of

everyone's mobility and accessibility. Camera access is also currently accessible digital, even via smartphones. Smartphones currently supported by increasingly sophisticated camera facilities provide camera quality with excellent resolution according to the needs of the users of the smartphone. Cameras can document various kinds of important events or momentum so that they can be stored and also viewed again at a later date. For now, the camera can support the creation of different content that can be used as a source of information in the form of illustrations that can clarify the delivery of information as a form of visual communication (Vigoroso et al., 2020). The development of the era is increasingly rapidly showing an unstoppable level so that various technologies compete with each other in creating the best camera technology. Whether it is in terms of design or technology, this cannot be separated from historical discoveries in the past related to technological discoveries. Muslim scientists, namely Ibn al-Haitham, pioneered the camera and the invention of camera technology.

Figure 2 Camera Obscura Illustration
Source: www.behance.net

The discovery of a camera that was created in sophisticated conditions began with a relatively long historical development and did not suddenly become a digital camera that is currently enjoyed and can be felt its benefits. The main idea of the invention of this camera, which Ibn Al Haitham coined in the early 11th century, the point of the camera used is the invention of the camera obscura, where this camera uses a lens to focus light in a dark box (Acosta et al., 2017). The lens can produce images on the surface of the paper. What is in the box, and the underlying theory, is the theory of objects used for various types of cameras with analogous working schemes (Grasnick, 2021). Thus the camera uses optical theory due to a simple reflection of an image in an object in real life, and then an image is captured through a reflected medium. The idea of making a camera obscura has made other scientists produce more sophisticated cameras with modern scientists' development from time to time.

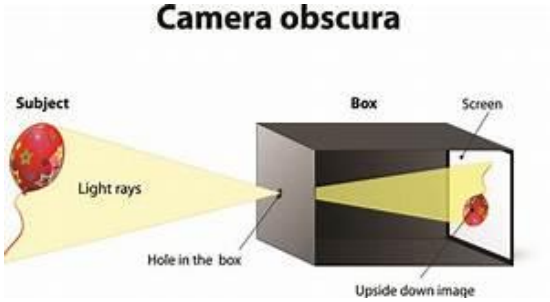

Figure 3 Scheme of Camera Obscura
Source: https://youth-time.eu

Scientists at that time were already interested in the study of light entering a room in a small hole through a mirror through a wall with an image which later contradicted the point of the principle of black space defined by Aristotle described by Ibn Al Haitham where on the camera obscura device which is a Lightproof box that on the surface there is a small hole or aperture. On the inside of the box opposite the hole will appear a projection of any image directed in front of the hole; this is the basic principle of how the camera was found (Dowsett & Adriaens, 2021).

E. Development of The Invention of The Camera by Modern Scientists

In the 13th century, an English scholar, Robert Balkan, appeared, who later adapted the discovery made by Ibn Al Haitham, namely the camera obscura, to produce a pinhole camera that utilizes the pre-existing principle of light. The camera obscura is described as being able to observe objects against the phenomenon of solar eclipses, and its discovery by Robert brought this optical principle to Europe so that the world of photography was born.

Over time, in the 17th and 18th centuries, many European scientists emerged and attempted to develop the camera obscura with a previously known mechanism, namely the light mechanism applied in-camera development through various experiments produced with various materials with different properties—levels of sensitivity and sensitivity to light and produce a photo (Brady et al., 2020). The experimental results show that the proof of the principles of light that was developed has had far better results than the first discoveries in the field of photography (Galili, 2021). In 1827 a French inventor named Joseph Niepce produced the first photograph using a plate covered with silver with a camera design made of wood.

The first photo produced by Niepce was produced by Charles Chevalier, who made the first photo in the form of a street view photo on a window and through the process of exposure photography to capture a moving object. Made another French scientist, Jacques Daguerre, continued to develop the process of using copper plates to record images using various chemical

elements that can record the color spectrum of partial light into photographic objects.

The development of cameras in the 20th century, which ran from the 19th century, was introduced by the Eastman Kodak company. George Eastman introduced the development of miniature cameras at affordable prices and can be used easily. Professionals chose the ancient camera revolution known as the film roll in photography to use film cameras, single-lens reflex cameras, and several other types. The camera is designed with electronic components to adjust the light, control automatic exposure, and focus on the image. In 1980, the point-and-shoot camera with automatic mode appeared for the first time, and prototyping for digital cameras in 1970 (Houston, 2019).

Digital cameras that are currently developing and we also use are adapted from various developments of electronic sensors in digital files that optically the camera can be used to Digital Image capture adopts from film-based cameras where there is a difference in the mechanism of the mirror lens and also with the lens to export the film into a better image. The electronic system produced the color of light in the form of a data set. The camera can be used to produce images in print form. Digital cameras were launched to consumers in the 1900s (Holland, 2021) . Currently, various price variations of cameras are tailored to the needs and preferences of users for the various needs of the camera itself, with the primary goal not only to document a moment.

In the era of globalization, of course, everything cannot be separated from technology, the need for digital access, and the use of cameras to support human needs from various circles, including supporting the learning process using digital technology. Camera technology that is currently developing can undoubtedly be accessed more effectively. And efficient. It is appropriate that in the future, science that continues to develop must be accompanied by a passion for continuous learning and learning new things. Following the times and must be adaptive to existing technology so that it can compete and face digital developments with various transformations that are more advanced to make technological developments more helpful in facilitating human activities.

CONCLUSION

The invention of the camera was first initiated by the most influential Muslim physics scientist, namely Ibn al-Haitham, who was founded in the 11th century which was developed continuously by modern scientists from time to time to create digital technology, namely the application of digital cameras that can be accessed more easily. easy and can capture a better digital image in the world of quality photography. The development of optical physics from applying the theory of light to cameras can be the initial mechanism of technological development and visualization in the field of geometric optics and other optical tools that initiate the presence of more sophisticated cameras and support various user activities.

The study of technological discoveries from Muslim leaders should be reviewed more, and future research is expected to be able to map out how the mechanism of scientific discoveries towards optical technology continues to work with various phenomena and is associated with technology that currently exists to be able to examine how the potential development of digital technology in the world is future through a review of the history of physics.

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