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## The Science Education and History of Ulugh Beg: Astronomer and Mathematician from Samarkand, Uzbekistan

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### ABSTRACTS

This paper discusses in short about Ulugh Beg, astronomer and mathematician from Samarkand, Uzbekistan. This paper is important for giving education to our generation, especially the Muslim generation that there are Muslim astronomers who are famous and have open minds and knowledge. This paper is expected to advance the spirit of Muslim countries, which at present are still in limited socio-economic conditions so that Muslim countries can rise in the socio-economic and scientific fields.

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## 1. INTRODUCTION

History has become an important part of human civilization until now (Vuorinen *et al.*, 2007). With history, we can know events that happened in the past and learn many things from them to be applied to the present (Wineburg, 1991). Many people think that studying history is boring (Evans, 1988). However, many benefits can be obtained by studying history.

History is related to education. Education is what will provide benefits in the future (Weisbrod, 1962). One of them is to build a critical mind which is useful for building a career. The other reasons that need to know the importance of studying history are:

- (i) It improves moral understanding and character (Afriani *et al.*, 2022). By studying history, we can find out many things that happened in the past. History is a multifaceted discipline that is useful for increasing cultural awareness and understanding of morals and character. Studying history will open your horizons about human behavior and how it socialized over time.
- (ii) People have ever heard older people say that today's generation of children is different from that of the past (Quintelier, 2007). The main thing is the moral understanding and attitude of today's children who are considered less polite than ancient children. By studying history, people can find out how ancient people behaved in upholding existing morals and applying them to everyday life.
- (iii) It is widening knowledge. Some people consider the historical sequence too long to be too boring to study. History is a complex field because it requires a critical mind to understand the chain of events, from the beginning to the end. One example is the history of the colonization of a nation, so far people know that the events of colonialism lasted for several centuries. However, the actual sequence of events that occurred was more complicated than that. Studying history can broaden your horizons. By studying history, people can better understand what is happening around people and understand how that sequence of events came about. People do not just glance at the event and summarize it. People will automatically be curious and try to analyze how the event occurred.
- (iv) It builds a critical mind. Studying history will build more critical thinking in our brain because people do not just look at things from one side, but take things from another point of view. For example, when people read the history of criminal cases that have not been solved to date, people will be curious about the truth and try to find other theories or build their theories. People will feel enthusiastic when people want to find the answer until people are willing to read many references and sources related to the event. Subconsciously, people have been thinking critically and developing new knowledge.
- (v) History is not only focused on date and time. Some people think that history only focuses on times, dates, names of people, and events. The types of questions such as what, who, when, and where, are just the beginning. A historian or someone interested in studying history will explore further the events that occurred. Like how it could happen, or why it could happen like that. By studying history, people will be more interested in revealing the truth that happened than just assuming it. Historians usually reach an agreement on the general facts surrounding the events that took place, but then interpret them in many different ways.
- (vi) Becoming a historian will have a great influence on the world. Becoming a historian will make people a great influence in the world. By studying history, we can develop a better understanding of life in today's world. Developing knowledge about events that have happened in the past builds a greater appreciation for events that are happening in the

present. Studying history can also build better anticipation for the future so that adverse events in the past do not repeat themselves.

(vii) Studying history can build a career. Many people do not know that this field that is considered boring can be a support for building a career. There are many career options for a historian or someone interested in studying history. Some of these can put people in popular and promising positions, such as the Department of State and Immigration, journalists, tourism media, consultants, heritage planners, librarians, and public historians. People can also create documentaries and personal YouTube channels that provide historical content.

This paper explored Ulugh Beg, one of the most well-known scientists in the world.

This study is crucial for educating our generation, particularly the Muslim generation, about the existence of outstanding Muslim astronomers with open minds and a wealth of knowledge. This work is intended to advance the spirit of Muslim nations, who at the moment still experience constrained socioeconomic conditions, allowing them to grow both socioeconomically and scientifically.

## 2. METHODS

This paper is based on the history of Ulugh Beg obtained from some online information and literature. The method of obtaining information is described elsewhere ([Azizah et al., 2021](#)).

## 3. RESULTS AND DISCUSSION

Ulugh Beg (Persian: *رزا ارق ابڤخ الغب* – *Mīrzā Muhammad Tārāghay bin Shāhrukh Ulugh Beg*) was the Sultan of Mawaraunnahr and an astronomer and mathematician. Ulugh Beg was born in Soltaniyah, Iran in 1394 and died in 1449 in Samarkand, Uzbekistan. Samarkand was the capital of Mawaraunnahr, and Herat was the capital of Khorasan. Ulugh beg's father was ruling from Herat.

He is the grandson of Timur Leng (Tamerlan) who is called the conqueror of Asia. If Timur Leng and the rest of his family were soldiers, then Ulugh Beg was a scientist.

He was entrusted by his father to be king in Samarkand, Uzbekistan. Following his great interest in science, he built the city into a center of Muslim culture and knowledge. In the city of Samarkand, he built a madrasa or a kind of university today and invited many scientists to do research. The research carried out is not limited to literature and the study of the Koran. He even focused on research in mathematics, trigonometry, and geometry.

Until now, we can see the buildings and monuments of Ulugh Beg's legacy in the city of Samarkand. It was there that he wrote poetry, and history books and studied the Qur'an. Despite this, astronomy and mathematics were the main fields of great interest to him. He intervened directly to study and observe the stars. In 1420 he built an observatory in Samarkand to study the planets and stars.

Ulugh Beg built the largest stargazing building in the world. The building is in the form of a protractor as high as 40 meters (as high as a 10-story building). The building later became the largest observatory in the world. Together with several scholars, he compiled astronomical data, known as *Zeij Ulugh Beyj*. The *zeyj* (table) was completed in 1437 AD, and in the 17th century, it was translated into Western languages.

It is in this observatory that Ulugh Beg and his team manifest their love for God by sincerely working and worshipping. From the results of these observations, they prepared astronomical tables of the sun, moon, and planets that have been observed with a high degree of accuracy

and accuracy is not too much different from the observations of modern astronomers using various sophisticated telescopes. From the results of his observations and calculations, he and his team also corrected the calculations ever made by Roman astronomers such as Ptolemy. The results of their observations were compiled, among others, in the book "Zij-i-Djadid-iSultani".

In addition, there are many other books that they wrote in Arabic. Some of their work was translated by British and French astronomers several hundred years later. This shows that the results of their observations and calculations are so sophisticated for the size of the era that the data are still very useful hundreds of years later.

The Ulugh Beg observatory building in Samarkand is a gigantic apparatus designed to observe the stars in a fixed location on the horizon. The interior is in the form of a stone tunnel that is quite wide and long where the base is underground and ends in an open sky with a sky roof. Inside is equipped with 2 (two) stone bars placed in the right position to give maximum results in calculating the height of the distance to the stars. The Ulugh Beg Observatory in Samarkand also proved so sophisticated that equipment like this is still imitated and used by European astronomers today. Some of them are the Uraniborg observatory (1576) and the Stjerneborg observatory (1584). Not only in terms of its physical appearance and architecture, which is modeled after the Ulugh Beg observatory, but also in terms of the quality and quantity of equipment, and even the management of its operations.

Ulugh Beg is perhaps the only Islamic scholar who has ever been the head of state in an area in Khurasan. During his reign, he was not only interested in and carried out research and development in the fields of astronomy and mathematics, but also encouraged the development of science in general. Not only by paying attention formally, but also by providing physical facilities, facilities, and infrastructure. He was born in Soltamiya in 1394 and died in 1449 in Samarkand, Uzbekistan.

He is the grandson of Timur Leng who is called the conqueror of Asia. He was entrusted by his father to be king in Samarkand, Uzbekistan. Following his great interest in science, he built the city into a center of Muslim culture and knowledge. Until now, we can see the buildings and monuments of Ulugh Beg's legacy in the city of Samarkand. It was there that he wrote poetry, and history books and studied the Qur'an. Despite this, astronomy and mathematics were the main fields of great interest to him. He intervened directly to study and observe the stars. In 1420 he built an observatory in Samarkand to observe the planets and stars. The observatory was very simple and we can still see it today.

It is in this observatory that Ulugh Beg and his team manifest their love for God by sincerely working and worshiping so that they receive God's help. Indeed, God promises to help His pious servants. From the results of these observations, they prepared astronomical tables of the sun, moon, and other planets that have been observed with a high degree of accuracy, whose accuracy is not too much different from the results of modern astronomers using various sophisticated telescopes. From the results of his observations and calculations, he and his team also corrected the calculations made by Roman astronomers such as Ptolemy. The results of their observations were compiled, among others, in the book "Zij-i-Djadid-iSultani".

In addition, there are many other books that they wrote in Arabic. Some of their work was translated by British and French astronomers several hundred years later. This shows that the results of their observations and calculations are so sophisticated for the size of the era that the data are still very useful hundreds of years later. The Ulugh Beg observatory building in Samarkand is a gigantic apparatus designed to observe the stars in a fixed location on the horizon. The interior is in the form of a stone tunnel that is quite wide and long where the base is underground and ends in an open sky with a sky roof. Inside is equipped with 2 (two)

stone bars placed in the right position to provide maximum results in calculating the height of the distance of the stars that are observed. Ulugh Beg's Observatory in Samarkand, which was built based on God-given inspiration, proved so sophisticated for its time, that equipment like this is still imitated and used by European astronomers for more than 100 years later, including the Uraniborg observatory (1576) and the Stjerneborg observatory (1584). Not only in terms of physical appearance and architecture, which is exemplified by the Ulugh Beg observatory but also in terms of the quality and quantity of equipment and even the management of its operations. Until the 18th century, the Ulugh Beg observatory was still an institution that was respected by world astronomers. Such is the sophisticated science and technology that Allah bestows on His servants who earnestly seek taqwa.

#### 4. CONCLUSION

Ulugh Beg, an astronomer and mathematician from Samarkand, Uzbekistan, is briefly described in this paper. This study is crucial for educating our generation, particularly the Muslim generation, about the existence of outstanding Muslim astronomers with open minds and a wealth of knowledge. This work is intended to advance the spirit of Muslim nations, who at the moment still experience constrained socioeconomic conditions, allowing them to grow both socioeconomically and scientifically.

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#### 6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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