The Interrelation of Islam and Science: The Epistemological Foundation, The Contribution of Muslim Scientists, And its Relevance in the Development of Science

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ABSTRACT
The relationship between Islam and science is a fundamental aspect of human civilization. Islam not only positions knowledge as a means of understanding the realities of life but also provides theological, moral, and ethical foundations for acquiring and developing knowledge. This study aims to examine the interrelationship between Islam and science, the emergence of scientific discoveries within the Muslim intellectual tradition, the contributions of Muslim scholars to the development of knowledge, and the position of knowledge from an Islamic perspective. This research employs a qualitative approach using library research methods through an examination of relevant academic literature, books, scholarly articles, and Islamic sources. The findings indicate that Islam and science are interconnected, particularly in encouraging intellectual activities, developing research traditions, and providing ethical orientations for the application of knowledge. The contributions of scholars such as Al-Khwarizmi, Ibn Sina, Ibn al-Haytham, Al-Biruni, Al-Farabi, Ibn Rushd, Al-Idrisi, and Ibn Khaldun demonstrate the significant role of Islamic intellectual traditions in the development of mathematics, medicine, optics, astronomy, philosophy, geography, and social sciences. This study emphasizes that the relationship between Islam and science does not necessarily require the direct identification of every scientific theory with religious texts. Instead, it can be developed through critical epistemological dialogue and the reinforcement of values such as honesty, justice, responsibility, and public welfare. Therefore, integrating Islamic values with scientific development is essential for building a civilization that promotes intellectual advancement and human well-being.

Keywords: Islam and Science, Islamic Epistemology, Muslim Scholars, Knowledge, Islamic Civilization.

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INTRODUCTION

Science is one of the fundamental elements in human life because it plays a role in shaping mindsets, developing intellectual abilities, and encouraging the progress of civilization. Through science, humans are able to understand various natural phenomena, identify life problems, and find solutions to various challenges faced by society. From an Islamic perspective, science is not only seen as an instrument to obtain material progress, but also as a means to recognize the greatness of Allah SWT, understand the essence of creation, and carry out human responsibilities as servants and caliphs on earth. Therefore, science has intellectual, spiritual, and moral dimensions that are interrelated (Estuningtyas, 2018).

The position of knowledge in Islam gained a strong foundation through the first revelation received by the Prophet Muhammad (peace be upon him), namely Surah Al-'Alaq verses 1–5. The command to read in this verse shows that intellectual activity, learning, and the search for knowledge are important parts of Islamic teachings. The command to read is not only related to the ability to understand texts, but can also be interpreted as an encouragement to observe, learn, and understand various realities of life. Masykur (2021) explained that Surah Al-'Alaq verses 1–5 contain a message about the importance of the process of learning and developing knowledge as part of human life.

In addition, the Qur'an gives appreciation to people who have knowledge. This is emphasized in Surah Al-Mujadilah verse 11 which explains that Allah SWT. will elevate the status of those who believe and have knowledge. This verse shows that faith and knowledge have complementary positions in shaping human qualities. Knowledge not only increases a person's ability to understand life's problems, but is also expected to strengthen spiritual awareness and moral responsibility in carrying out their activities. Rasyidi (2022) emphasized that Islam's attention to knowledge is reflected in various teachings of the Qur'an and hadith that encourage mankind to continue to learn and develop knowledge.

From a historical perspective, the relationship between Islam and science can be seen through the development of Islamic civilization which achieved progress in various scientific fields. During the period of Islamic intellectual development, translation, education, scientific discussion, observation, and research became an important part of building scientific traditions. Muslim scientists not only studied the inheritance of knowledge from previous civilizations, but also carried out the development, testing, and preparation of new thinking that contributed to the development of world science (Noktaria et al., 2025).

These contributions can be seen in various fields. Al-Khawarizmi made an important contribution to the development of mathematics through the development of algebra. Ibn Sina is known for his thoughts in the fields of medicine and philosophy. Ibn al-Haytham contributed to the development of optical science through research on light and vision. Meanwhile, Al-Biruni developed the study of astronomy, geography, and culture through a systematic observational approach. These contributions show that the Islamic intellectual tradition has a wide involvement in the development of science (Jailani, 2024).

Nevertheless, the relationship between Islam and science is still an important issue to be studied, especially when the development of science and technology is increasingly complex. Technological advances provide various conveniences for human life, but at the same time also present issues of ethics, responsibility, justice, and social impact. Science that is developed without paying attention to moral values has the potential to be misused for the benefit of humans. On the other hand, religious understanding that is not accompanied by adequate mastery of knowledge can cause limitations in dealing with the problems of modern life.

This problem shows that the relationship between Islam and science is not sufficiently understood as a historical relationship, but also needs to be studied epistemologically and practically. Islam provides a value orientation in the development of knowledge, while science

provides a method to understand various phenomena based on observation, reasoning, and research. Thus, the two can interact without having to eliminate the characteristics and methods of each discipline.

Based on this description, the study of the interrelationship of Islam and science is important to explain how Islamic teachings provide encouragement to scientific activities, how Muslim scientists develop knowledge, and how Islamic values can be an ethical foundation in the use of science. This research is directed to build an understanding that the advancement of science and the strengthening of Islamic values are not two things that must be opposed, but can be developed in a complementary manner in building human civilization.

METHOD

This research uses a qualitative approach with the library *research* method. This approach was chosen because the research focuses on conceptual studies and thought analysis regarding the relationship between Islam and science based on relevant written sources. Literature studies allow researchers to understand a problem through the study of various literatures, both in the form of books, scientific journal articles, and Islamic sources related to the object of study.

The source of research data consists of primary sources in the form of the Qur'an as a normative basis in understanding the position of science according to Islam, as well as secondary sources in the form of books and scientific articles that discuss Islamic epistemology, the history of scientific development, the contributions of Muslim scientists, and the relationship between religion and science. The literature used includes studies by Estuningtyas (2018), Muchlis (2010), Jailani (2024), Noktaria et al. (2025), as well as various writings on the thoughts and contributions of Muslim scientists.

Data collection is carried out through documentation, namely identifying, reading, recording, and grouping information based on the research theme. The data obtained are then analyzed in a descriptive-analytical manner by describing the concept of the interrelation of Islam and science, identifying the contributions of Muslim scientists, and interpreting the position of science in an Islamic perspective. Furthermore, the results of the study are systematically compiled to gain an understanding of the relationship between Islamic values, knowledge development, and civilization progress.

RESULTS AND DISCUSSION

The Concept of Interrelation of Islam and Science

Interrelativity in general can be understood as a reciprocal relationship or relationship between two elements that are interconnected and exert influence in a system. In the context of Islam and science, interrelation shows the relationship between religious teachings and the process of obtaining, developing, and using knowledge. The relationship is not only related to theoretical aspects, but also includes epistemological, ethical, and practical dimensions in human life.

Islam is a religion that provides guidelines regarding faith, worship, morals, and social responsibility. Meanwhile, science is the result of human intellectual activity obtained through the process of thinking, observation, learning, and systematic research. The two elements have different characteristics, but can interact in building human understanding of life. Islam provides moral and spiritual orientation, while science helps humans understand reality based on scientific methods that are in accordance with their field of study (Muchlis, 2010).

The interrelation of Islam and science can be seen through two main forms of relationship. First, Islam provides encouragement to the development of science through teachings that emphasize the importance of reading, thinking, observing, and studying the creation of Allah SWT. Second, science provides the ability for humans to understand various life phenomena so that this knowledge can be used to improve the welfare of society.

In this relationship, Islamic values such as honesty, justice, trust, responsibility, and benefit are important foundations in scientific activities. For example, research must be carried out by upholding academic honesty, openness to data, and responsibility for research results. Technology development also needs to consider its impact on human life and the environment. Thus, science is not only judged based on the ability to produce discoveries, but also on the benefits and responsibilities in its application.

However, the interrelation of Islam and science does not have to be interpreted as an obligation to prove every scientific theory directly through the verses of the Qur'an. The Qur'an has a position as a guide to life and a source of religious value, while science is developed through research methods that are in accordance with the object of study. The relationship between the two can be built through a critical and open dialogue, while respecting each other's characteristics. This understanding is important so that the integration of science and religion is not trapped in a simplistic equalization, but is able to produce more comprehensive thinking.

The Process of the Birth of the Discovery of Science in the Tradition of Muslim Scientists

The development of science in the Muslim intellectual tradition takes place through a long process involving observation, learning, reasoning, research, and dissemination of the results of thought. Scientific discoveries do not appear suddenly, but are the result of intellectual activities carried out on a continuous basis. This process shows that the Islamic scientific tradition pays attention to the activities of reading, studying, developing, and testing knowledge.

First, the process of developing science begins with observations of natural phenomena and human life. Scientists try to understand various events through observation, which then raises questions about the causes, processes, and relationships between certain phenomena. In the field of astronomy, for example, observations of the movements of the sun, moon, and stars encourage scientists to develop knowledge about the order of the universe.

Second, the development of knowledge is carried out through learning the knowledge that has been inherited by previous generations. Muslim scientists study and translate works from various civilizations, then review the thoughts contained in them. Translation activities not only function as a means of transferring knowledge, but also as a basis for the development of new thoughts. This process shows the existence of intellectual openness in the Islamic scientific tradition.

Third, scientists conduct research and testing to obtain more accountable explanations. In the field of medicine, for example, observation of disease symptoms and patient responses is an important part of the development of medical knowledge. Meanwhile, in the field of optics, research on light and vision is carried out through observation and experimentation. Ibn al-Haytham is one of the figures who shows the importance of an observation and testing approach in understanding natural phenomena (Jailani, 2024).

Fourth, research results are compiled in the form of explanations, theories, formulas, and scientific papers. The preparation of knowledge in writing allows the results of thought to be studied, examined, and developed by the next generation. Scientific works are also a means to disseminate knowledge through educational institutions and intellectual activities.

Fifth, the knowledge that has been produced continues to be developed by other scientists. This process shows that the development of science is a sustainable activity and involves the contribution of many parties. Nor Hidayat (2024) places the development of thought and research as an important part of the process of strengthening the Islamic scientific tradition.

Based on these stages, it can be understood that the Muslim scientific tradition is not only oriented to the mastery of existing knowledge, but also to the development and refinement

of knowledge through research. This shows that scientific activities in Islam are related to the spirit of seeking truth, openness to thought, and responsibility for the results of knowledge.

The Contribution of Muslim Scientists in the Development of Science

The history of scientific development shows that Muslim scientists made important contributions to various disciplines. These contributions were not limited to religious studies, but also included mathematics, medicine, astronomy, physics, chemistry, philosophy, geography, and social sciences. These developments show that the Islamic intellectual tradition has a wide scientific scope and has an influence on the development of world civilization (Noktaria et al., 2025).

Some of the Muslim scientists who made important contributions to the development of science can be described as follows.

1. Al-Khawarizmi (780–850 AD)

   Al-Khawarizmi is one of the Muslim scientists who had a great influence on the development of mathematics. His full name is Muhammad bin Musa Al-Khawarizmi. He is known as a mathematician, astronomer, and geography who lived during the Abbasid Dynasty. One of his main contributions was the development of algebra through the work *Al-Kitab al-Mukhtasar fi Hisab al-Jabr wal-Muqabala*. The work discusses the method of solving mathematical equations systematically. The term algebra then developed from the word *al-jabr* contained in the title of his work.

   In addition, Al-Khawarizmi also played a role in the development of the Hindu-Arabic number system that used zeros and place value systems. The term algorithm also has a historical relationship with the Latin form of the name Al-Khawarizmi, namely Algorithm. His contribution shows that Muslim scientists not only received knowledge from previous civilizations, but also developed calculation methods that had a wide influence on the development of mathematics and computational science (Modern, 2023).

2. Ibn Sina (980–1037 AD)

   Ibn Sina or Avicenna was a Muslim scientist known in the fields of medicine and philosophy. One of his greatest works is *Al-Qanun fi al-Tibb* or *The Canon of Medicine*. The work discusses various aspects of medicine, including anatomy, disease, diagnosis, treatment, and the use of medicine. The book is one of the important references in the history of medical education.

   Ibn Sina's thought shows that the development of medical science requires the ability to observe, reason, and have a deep understanding of the human condition. His contribution not only shows the breadth of mastery of science, but also shows the importance of the development of knowledge through the preparation of scientific systematics. His works were translated into Latin and influenced the tradition of medical education in Europe (Bulek, 2025).

3. Ibn al-Haytham (965–1040 AD)

   Ibn al-Haytham or Alhazen was a Muslim scientist who made important contributions in the fields of physics, mathematics, and optics. One of his famous works is *Kitab al-Manazir* or *Book of Optics*. In this work, he explained that vision occurs when light from an object enters the eye. This explanation is different from the previous view which considered that the eye emits something towards the object being seen.

   Ibn al-Haytham also emphasized the importance of observation, testing, and proof in the study of natural phenomena. This approach makes an important contribution to the development of scientific research, especially in the field of optics. His thinking shows that knowledge needs to be developed through a process of testing and argumentation that can be accounted for, not just based on unproven conjectures or opinions (Jailani, 2024).

4. Al-Biruni (973–1048 AD)

Al-Biruni is a Muslim scientist who has expertise in astronomy, mathematics, geography, history, and natural sciences. He is known for his meticulousness in conducting observations and research. In the field of astronomy, Al-Biruni studies the movement of celestial bodies and the relationship between the earth and various natural phenomena.

In addition, Al-Biruni makes measurements and calculations to understand the size and shape of the earth. His contribution is also seen in cultural studies through the work *of Tahqiq ma li al-Hind*, which discusses the life, culture, religion, and thought of the Indian people. The speciality of Al-Biruni's approach lies in its attention to precision, observation, and an objective attitude in understanding the object of study. This shows the importance of openness and objectivity in research activities (Pratama, 2022).

5. Al-Farabi (872–950 AD)

   Al-Farabi was a Muslim philosopher known in the fields of philosophy, logic, politics, and music. He developed a lot of philosophical thought through the study of the thought of Aristotle and Plato and related it to the Islamic intellectual tradition. One of his famous works is *Al-Madinah al-Fadilah* or The Main State.

   In this work, Al-Farabi puts forward the concept of an ideal society led by someone who has knowledge, wisdom, and good morals. His thinking shows that science has a close relationship with the formation of leadership and social life. Knowledge not only functions as an individual's intellectual ability, but also as a basis for building an orderly and just community life (Guntara, 2019).

6. Ibn Rushd (1126–1198 AD)

   Ibn Rushd or Averroes was a Muslim scientist from Andalusia who was famous in the fields of Islamic philosophy, medicine, and law. He had an important role in explaining and commenting on the works of Aristotle. One of his most famous works is *Tahafut al-Tahafut*, which contains a response to Al-Ghazali's thoughts in *Tahafut al-Falasifah*.

   Ibn Rushd paid attention to the relationship between rational reasoning and religious understanding. His thinking shows that the activity of thinking and the use of reason has an important place in the Islamic intellectual tradition. His works also influenced the development of philosophy, both in the Islamic world and Europe (Fitrianah, 2018).

7. Al-Idrisi (1100–1165 AD)

   Al-Idrisi was a Muslim scientist known in the fields of geography and cartography. He had the ability to compile maps based on travel information, observations, and reports from various regions. One of his most famous works is *Nuzhat al-Mushtaq fi Ikhtiraq al-Afaq*, also known as *Tabula Rogeriana*.

   The work provides a geographical overview of various regions of the world known at the time. Al-Idrissi's contribution shows the importance of information collection, regional observation, and systematic data preparation in the development of geography. His thinking also shows that knowledge about the world can be developed through openness to information from various sources (Jazari, 2023).

8. Ibn Khaldun (1332–1406 AD)

   Ibn Khaldun was a Muslim scientist who made great contributions in the fields of history, sociology, politics, and economics. His greatest work is *Al-Muqaddimah*, which discusses various aspects of social life, group solidarity or *ashabiyah*, power, economics, education, and civilizational change.

   Ibn Khaldun's thought shows a critical approach in understanding the changes in society. He not only views history as a collection of past events, but also seeks to explain the social factors that influence the development and decline of a society. His contribution shows that science can be used to understand the relationship between humans, social structures, power, and the dynamics of civilization (Sutikno, 2014).

The various contributions of these Muslim scientists show that the development of science in Islamic civilization takes place through intellectual openness, observation, research, and the development of thought. The success of these scientists is not only part of Islamic history, but also contributes to the development of human knowledge at large.

The Position of Knowledge in the Islamic Perspective

Knowledge has a very important position in Islamic teachings. This position can be seen from the many verses of the Qur'an that pay attention to knowledge and knowledgeable people. Islam views knowledge as a means to improve the quality of life, strengthen faith, and build human awareness of his responsibilities as creatures of Allah SWT.

One of the main foundations regarding the position of knowledge is found in Surah Al-Mujadilah verse 11. This verse explains that Allah SWT. exalts the degree of those who believe and those who are given knowledge. The message shows that faith and knowledge have a close relationship in shaping human qualities. A person who has knowledge is expected to be able to use his intellectual abilities to understand life better while increasing his spiritual awareness.

The position of knowledge can also be understood through Surah Al-'Alaq verses 1-5 which contain the command to read. This verse emphasizes that knowledge is something that can be obtained through the process of learning and teaching. The command to read is an important basis for the formation of an intellectual culture in Islam. Through the activity of reading, humans obtain information, expand their horizons, and develop the ability to think critically.

Estuningtyas (2018) explained that science in the perspective of the Qur'an has an important position because it is related to the ability of humans to understand the signs of Allah's greatness and carry out their lives. Thus, the search for knowledge is not only aimed at meeting worldly needs, but also as a means to increase human awareness of divine values.

In addition, knowledge in Islam has a dimension of responsibility. The knowledge possessed by humans should not be used for the benefit of others, but directed to produce benefits and benefits. Knowledge accompanied by faith and morals will provide a moral orientation to every human action. Therefore, the mastery of knowledge needs to be balanced with the formation of character, honesty, and social responsibility.

Rasyidi (2022) shows that Islamic teachings pay attention to the activity of seeking knowledge as part of the formation of religious and moral qualities. This shows that knowledge cannot be separated from the formation of human personality. The wider a person's knowledge, the greater his responsibility to use this knowledge correctly and usefully.

Thus, the position of knowledge in Islam is not only related to the appreciation of intellectual intelligence, but also to the formation of human beings who have a balance between knowledge, faith, and deeds. Science is a means to understand life, while Islamic values provide guidelines regarding the purpose and how to use it.

The Forms of the Relationship between Islam and Science in Modern Life

The relationship between Islam and science can not only be understood through the history of the development of Islamic civilization, but also needs to be seen in the context of modern life. The development of technology, social change, and the complexity of human problems require a comprehensive understanding of the relationship between knowledge and religious values. In this context, there are several forms of relationships that can be explained as follows.

1. Islam as a driver of scientific activities

   Islam provides encouragement to humans to continue learning and developing knowledge. The command to read in Surah Al-'Alaq verses 1–5 is the normative foundation for the development of a culture of literacy, education, and research. Reading activities can be an entrance for humans to understand various problems and expand their horizons.

This encouragement shows that the activity of seeking knowledge is not just an academic activity, but also part of human efforts to develop the potential that has been given by Allah SWT. With knowledge, humans can understand reality more deeply and find various alternative solutions to life's problems (Masykur, 2021).

2. Islam as the ethical basis for the use of knowledge

   Science has the ability to produce various changes in human life. However, this ability requires moral guidelines so that it is not misused. Islam provides ethical values such as honesty, justice, trust, responsibility, and concern for others.

   In academic activities, the value of honesty can be realized through the objective presentation of research data and the inclusion of reference sources correctly. In technology development, moral responsibility can be realized by considering the security, privacy, and social impact aspects of the technology used.

   Thus, Islamic values can provide an ethical orientation for the development of science so that it is not only oriented to technical achievements, but also pays attention to the interests of humans and society.

3. Science as a means of understanding nature and life

   Islam encourages humans to pay attention to the various signs of Allah's greatness found in the universe. This encouragement can go hand in hand with scientific activities carried out through observation, data collection, and research.

   Environmental science, for example, helps humans understand pollution and natural resource management. Health science provides knowledge about disease prevention and improving quality of life. Meanwhile, social science helps explain human relationships and community dynamics.

   This knowledge can be used to carry out human responsibilities towards themselves, society, and the environment. Therefore, the development of knowledge has a relationship with Islamic values that emphasize responsibility and benefit.

4. Islam and science in the development of education

   Education is one of the important spaces for the meeting between science and Islamic values. Islamic education is not only directed to provide an understanding of religious teachings, but also to form human beings who have insights, skills, morals, and responsibilities.

   In the educational process, science provides the conceptual foundation and skills needed to understand various problems. Meanwhile, Islamic values provide spiritual and moral orientation in applying this knowledge.

   For example, in the field of psychology and counseling, scientific knowledge helps to understand human behavior and needs. Islamic values can be a source of spiritual strengthening for Muslim students according to their individual needs and conditions. This relationship shows that scientific knowledge and religious values can be used side by side without neglecting scientific methods or ethical principles.

5. Islam and science in building the progress of civilization

   The progress of civilization is not only determined by the ability of humans to produce technology, but also by the quality of education, intellectual culture, and moral values that develop in society. The history of Islamic civilization shows that translation, education, discussion, observation, and research activities are an important part of building scientific traditions.

   The contributions of Muslim scientists in the fields of mathematics, medicine, astronomy, philosophy, and social sciences show that the development of knowledge has an important role in the progress of society. Hasir and Ritonga (2019) show the importance of

knowledge development in social life and education as part of efforts to improve the quality of society.

In the modern context, the relationship between Islam and science can be realized through the development of education that is open to the development of knowledge, research oriented to problem solving, and the application of technology that pays attention to the interests of society. Thus, the progress of civilization needs to be supported by a balance between intellectual ability, mastery of technology, and the strengthening of human values.

Analysis of the Interrelation of Islam and Science in an Epistemological Perspective

Based on various previous descriptions, the interrelation of Islam and science can be analyzed through three main dimensions, namely the epistemological, ethical, and civilization dimensions.

First, the epistemological dimension is related to the way in which humans acquire and develop knowledge. Islam provides encouragement to use reason, read, observe, and study life phenomena. Meanwhile, science has a method used to test and explain reality based on the characteristics of its object of study. The relationship between the two shows that the search for knowledge requires intellectual openness and appreciation for the process of proof.

Second, the ethical dimension is related to the purpose and responsibility of the use of knowledge. Science does not always produce a positive impact if it is not accompanied by moral awareness. Therefore, Islamic values such as honesty, justice, trust, and benefit are important in providing orientation to scientific activities. In this context, the success of science is not only measured by its ability to generate innovation, but also by its benefits and impact on human life.

Third, the dimension of civilization is related to the contribution of science to the development of society. The history of Muslim scientists shows that openness to knowledge, educational development, and research activities can produce progress in various fields of life. This contribution is proof that religion and intellectual activity can develop side by side in building a knowledgeable society.

These three dimensions show that the interrelationship of Islam and science is not sufficiently understood as an effort to include religious elements in every discipline. This relationship needs to be developed through critical dialogue, respect for the scientific method, and the strengthening of moral values. With such an approach, science can develop rationally and systematically without losing its human orientation and spiritual responsibility.

Therefore, the development of knowledge in the perspective of Islam needs to be directed at the formation of human beings who have intellectual ability, spiritual depth, and moral maturity. These three are important elements in building a civilization that is not only materially advanced, but also has responsibility for human life and the environment.

CONCLUSION

The interrelation of Islam and science is an interrelated relationship in the process of obtaining, developing, and using knowledge. Islam provides a theological, spiritual, and moral foundation that encourages humans to seek knowledge and use it responsibly. Meanwhile, science helps humans understand various phenomena of life through the process of thinking, observation, research, and testing systematically. This relationship shows that Islam and science can be developed side by side without having to eliminate their respective characteristics and scientific methods.

The development of the Islamic intellectual tradition also shows the important contributions of Muslim scientists in various disciplines. Al-Khawarizmi in mathematics, Ibn Sina in medicine, Ibn al-Haytham in optics, Al-Biruni in astronomy and geography, Al-Farabi and Ibn Rushd in philosophy, Al-Idrisi in cartography, and Ibn Khaldun in social sciences show that Islamic civilization has a broad scientific tradition. These contributions were born through

the process of observation, learning, research, development of thought, and the dissemination of knowledge.

From an Islamic perspective, science has a high position because it is a means to improve human quality, understand the greatness of Allah SWT, and realize the benefits of life. However, the mastery of science must be balanced with the values of honesty, justice, trust, and responsibility so that knowledge is not misused. Thus, the interrelation of Islam and science needs to be developed through a critical and ethical epistemological approach, so as to be able to form a civilization that is intellectually advanced, spiritually strong, and socially responsible.

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