

Merits of Scientists and Thinkers of the Eastern Renaissance in the Progress of Science

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Abstract

This article explores the philosophers and astrologers, who became famous for their merits in the field of science and education throughout the Eastern world, including Movarunnahr and their scientific heritage of such encyclopedic scientists as Al-Khwarizmi, al-Fargani, al-Khuttali, al-Javhari, Abu Nasr Farabi, Abu Rayhan Beruni, Abu Ali Ibn Sina and their role in the history of world civilization.

Keywords Eastern Renaissance; cultural development; civilization; al-Mamun; science

1 Introduction

If we look at the history, our ancestors have left us a great enlightenment, a huge cultural and spiritual heritage, which has an incomparable value even today. As stated by the first President Islam Karimov, “any changes and innovations in the development of society, especially the processes and discoveries that give a great impetus to the development of humanity, do not happen by themselves. For this, age-old traditions, appropriate conditions, a school of thought, and a cultural-spiritual environment must first exist” (Karimov, 2008).

Our people, who lived with such noble goals and thoughts, made a great contribution to world development. Science and culture have long been developed in the territory of our country, which connects the East and the West, where great civilizations meet.

It is known that the upsurge in cultural life that began in the IX century in Eastern countries led to changes in spiritual life as well. This rise was called the Eastern Renaissance because it encompassed the entire Arab caliphate, Yakin and Middle East (Hayrullaev,1971). This revival process started from the IX century and continued until the XV and XVI centuries.

2 Materials And Methods

Along with the Arab peoples, scientists from Iran, North Caucasus, North Africa, and Central Asia also took part in this process. Because the renaissance period that arose in the IX century in the Arab caliphate began in the cities of Baghdad, Damascus, Aleppo and spread to the cultural life of all other nations, which prepares the ground for cultural development in those countries and starts this process.

We can know this from the establishment of “Baytul Hikma” (“House of Wisdom”) in Baghdad (813-833 AD) during the time of Caliph Harun al-Rashid and his son al-Ma’mun, in the modern sense of the Academy. “This Academy will become a center where all scholars gather. A world library was established under him, there was also an observatory, and later a new library was built. This center of knowledge in Baghdad, in turn, influenced the development of science and spiritual life in the East and West” (Hoshimov&Hasanov,1996).

In this place, it is worth noting the patronage shown by Caliph al-Ma’mun in the development of science.

Because caliph al-Ma’mun valued science very much. At the beginning of the IX century, when he was the viceroy of the caliphate in Khurasan, he gathered scientists from Mowarounnahr and Khurasan and created conditions for their scientific creativity. Among them, al-Khorazmi, al-Khuttali, al-Jawhari, al-Farghani, al-Marwazi called all the native scientists to Baghdad and in “Baytul Hikma” - the house of wisdom (“Ma’mun Academy”) in cooperation with Arab scientists (Charts 1 and 2).

It should be noted that **In the cultural development of the Eastern Renaissance, we see that science conditionally developed in three directions** (Hasanov, 2018).

First direction- mathematics, medical sciences, including mathematics, astronomy, chemistry, geography, geodesy, mineralogy, medicine, pharmacology and other related sciences, Muhammed Musa al-Khorazmi, Ahmad Farghani on mathematics, Zakriya ar-Razi on chemistry and medicine, Ibn Sina, Jurjaniy, medicine and philosophy, Abu Raykhan Beruniy, Ulugbek Ali Kushchilar created great works on astronomy and medicine.

Second direction — is a socio-philosophical direction, which includes philosophy, technology, logic, jurisprudence, spiritual science, oratory and other fields, in this field Al-Farabi, Al-Kindi, Ibn Rusht, Ibn Sina, Zahiriddin Bayhaki, Muhammad Narshakhi and others can be mentioned.

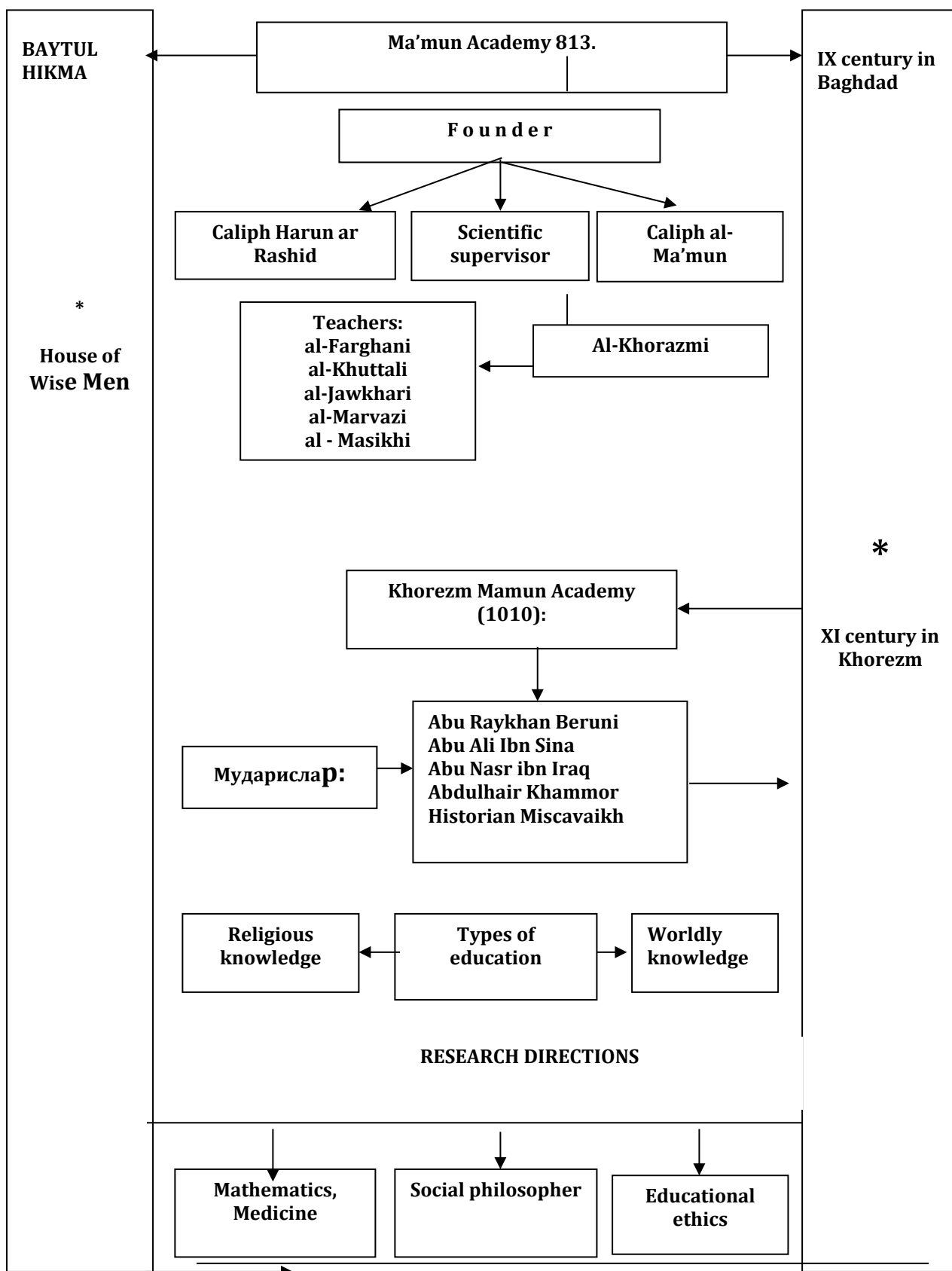
Third direction — is an educational-ethical direction, encyclopedic scientists in this field express their views in their socio-philosophical works.

In addition to the whole East, Movarounnahr also has a philosopher and astrologer who is famous in the world for his services in the field of science and enlightenment, left a name with his scientific heritage in the fields of mathematics, physics, medicine, history, language and literature pedagogy: Al-Khorazmi, Abu Nasr Farabi, Al-Farghani, Abu Raykhan Beruni, Abu Ali ibn Sina, and other encyclopedic scholars came to the field.

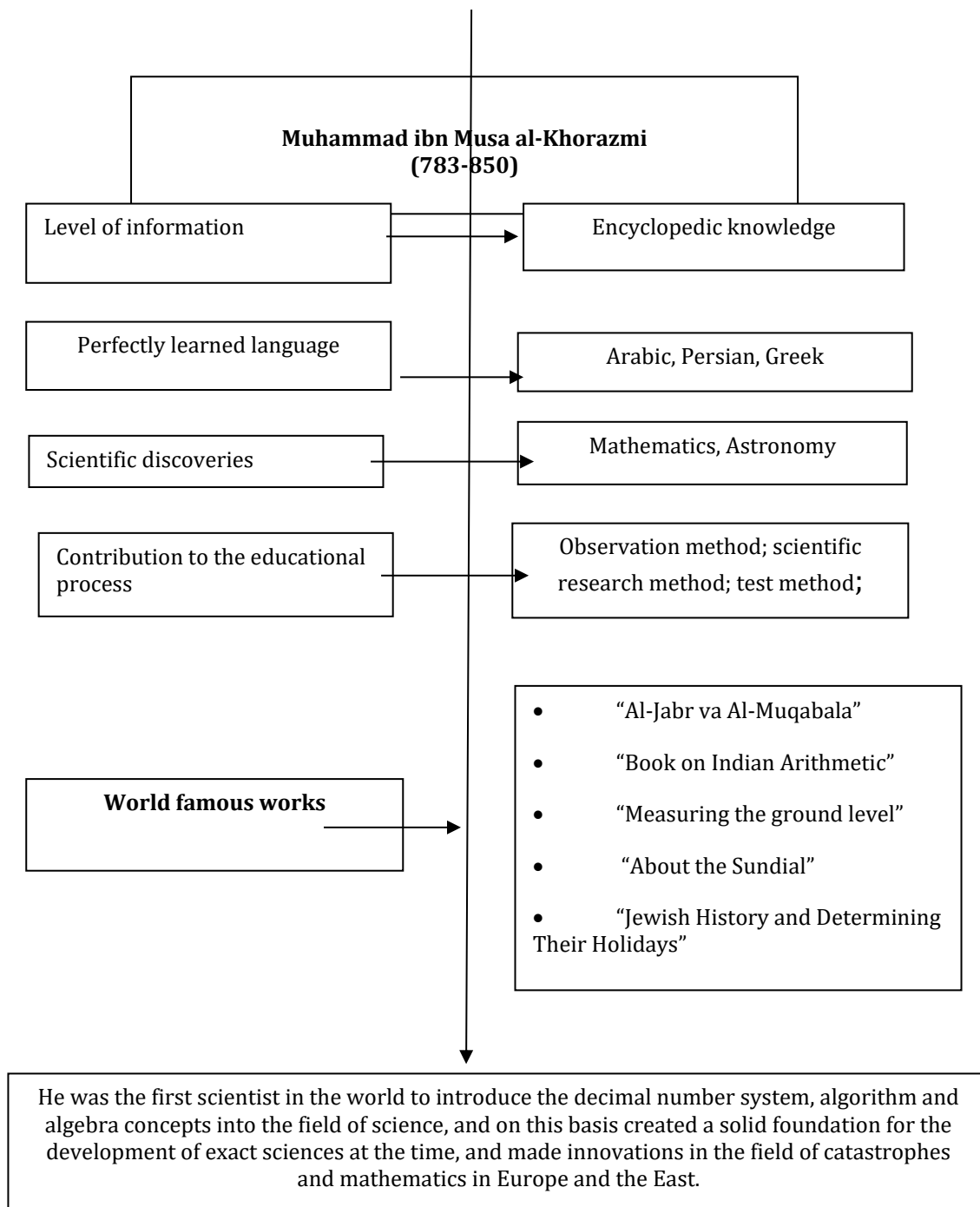
The encyclopedic scientists paid great attention to the creation of educational and moral works in their scientific heritage, and the ideas presented in these works were of great importance in the development of the human being from the intellectual, moral, aesthetic and

physical aspects, as well as in the development of natural and social sciences.

Chart 1



Chart



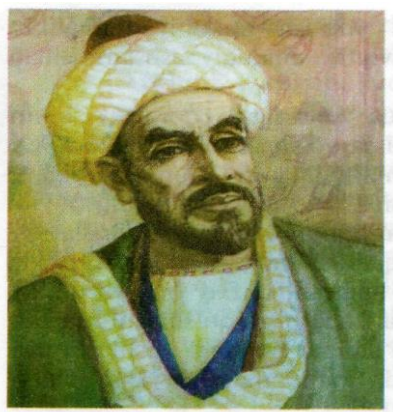
In the Middle Ages, Ma'mun Academy in Baghdad and Khorezm Ma'mun Academy had structures such as a library, madrasa, school of translators and calligraphers, and more than a hundred scholars and talented students conducted scientific research there. Examples of such encyclopedic scholars as Abu Nasr ibn Iraq, Abu Rayhan Beruni, Abu Ali ibn Sina, Mahmud Khojandi, Ahmad ibn Muhammad Khorazmi and Ahmad ibn Hamid Naisaburi can be cited.

3 Results And Discussions

The fact that the 1000th anniversary of Khorezm Ma'mun Academy was widely celebrated in our country with the participation of UNESCO, and the reorganization of its activities is a vivid example of the great attention paid to the memory of ancestors and the

development of science in our country. Now, in this ancient and modern place of science, scientific researches on the history of Khorezm, its unique culture, ecology, land and water resources are being continued.

One of the greatest thinkers and scientists of that time is Muhammad Musa Khorezmi. Today, the calculations used by the whole world, the operation of modern technologies are based on the rules created by our ancestors. The whole world highly appreciates Khorezmi's contribution to the development of science and pays special respect to the land that brought him up.



The word "Algebra" is taken from the work "Al-kitab al-mukhtasar fi lis al-jabr va al-muqabala" by Muhammad Khorazmi (783-850), one of the great representatives of the Renaissance, a mathematician, astronomer, geographer and the founder of the science of algebra.

The observatory built by Caliph Ma'mun in Baghdad in the IX century was very perfect in many ways, i.e. in terms of installed equipment and construction aspects. Also, in the construction of this observatory, mature scientists and masters of that time worked together. It is noted in the sources that the services of our great compatriot Muhammad Khorezmi were great in the establishment of this observatory.

Muhammad Musa Khorezmi created "The Book of the Image of the Earth", "Kitab al-Jabr wa al-Muqabola" and dozens of other great works. But most of the scientist's works have not reached us. Khorezmi's greatest service in the history of mankind and to mankind is that his work "Kitab al-jabr wa al-Muqabola" laid the foundation for the modern science of algebra and thus ensured the development of the science of mathematics in the following centuries, especially the development of the technical sciences that appeared in the following centuries.

Al-Khorezmi founded the science of algebra, developed clear rules for the presentation of scientific information and treatises, he is the author of many scientific works on astronomy, geography and climate theory. Scientist's services to the development of world science were universally recognized, and among Eastern scientists only his name and works were immortalized in modern scientific terms such as "algorithm" and "algebra".

Islam Karimov



Another great ancestor of ours, one of the encyclopedic scholars who made a great contribution to world science and culture, is Ahmad al-Farghani Abdul Abbas ibn Muhammad ibn Kasir (798-865). Ahmad Farghani is the most powerful and powerful representative of the early Renaissance in the history of mankind, one of the founders of the fundamental science of his time, a scientist who had an incomparable influence on the development of the worldview and spirituality of humanity. Ahmad al-Farghani is a great scholar born and raised in Ferghana. He is a scientist who made scientific discoveries in the natural-scientific field - mathematics, astronomy, geography, wisdom and a number of other subjects, while teaching at "Baytul Hikma" in Baghdad,

which is a major center of knowledge. It should be noted that the paintings created by al-

Farghani have been serving humanity since 1200.

It is well known through historical sources that his priceless legacy served as a program for the scientists of his time, and the fact that Scientist's work entitled "Book on the Basics of Astronomy" was translated into Latin and Hebrew as early as the twelfth century is a proof of this idea.

This scholar, known in Europe as Al Fraganus, had such a high influence in the development of science that his name became famous not only on earth, but also in heaven. The fact that one of the lunar carts was named after him in the sixteenth century proves this point (Karimov, 2008).

Among world intellectuals, he became famous as a great astronomer, mathematician and geographer, and in the East he was nicknamed "Khasib" - (mathematician). His works in the field of astronomy, geography and mathematics made a significant contribution to the development of these sciences and became a guide for scientists after him.

Although information about Al-Farghani's life is scarce, his name was well-known in the Middle Ages in the East. Eastern historians such as Ibn al-Nadim (X century), Ibn al-Qifti (XII-XIII centuries), Abul Faraj Bar Ebrey (XIII century), Haji Khalifa (XVII century) mention him in their works.

Al-Farghani's major astronomical work, "The Book of Celestial Movements and General Science of Astronomy" ("Kitab al-harakat as-samovia wa jawami' ilm an-nujum") was translated twice into Latin in Europe in the XII century and into other European languages in the 13th century. its Latinized name in the form of "Alfraganus" spread widely in the west for several centuries. His book served as the main astronomy textbook in European universities for centuries.

The translation of Al-Farghani's works in Europe and their publication in world languages for the first time in 1193 gave him the name "The First Arab Astronomer" among world scientists.

In 1669, after the famous Dutch mathematician and Arabic scholar Jacob Golius published the Arabic text of al-Farghani's work with a new Latin translation, the fame of al-Farghani and his work in Europe increased even more.

It is worth noting that Ahmed Ferghani is a scientist who made a great contribution to the emergence and development of Arabic scientific terminology. He participated in the construction of Baghdad and Damascus observatories. Ptolemy participated in the verification of the information in the "Star Table". Ferghani carried out astronomical observations at the Baghdad observatory, made many discoveries. In particular, he foresaw the solar eclipse of 812. He proved with strict scientific evidence that the earth is spherical.

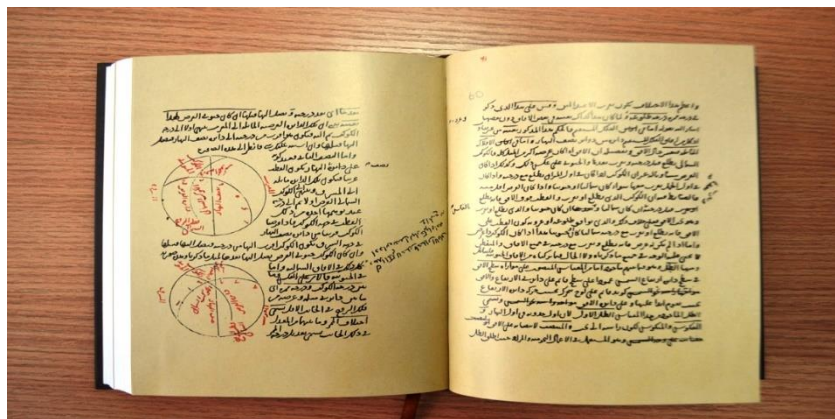
During the Arab caliphate period, especially during the period of caliphs Harun al-Rashid and his son al-Ma'mun, interest in Greek scientific works, especially their translation, began to grow. During this period, Baghdad became the center of scientific translation work. Representatives of different countries and nationalities took part in the translation work, among them were Ahmad Farghani from Central Asia, along with Muhammad Khorezmi, Abbas ibn Sa'id Jawhari and Ahmad ibn Abdullah Marwazi.

During the reign of Caliph al-Ma'mun, two observatories were built: one in Baghdad, in a place called Shammosiya, and the other on a mountain called Qasiyun near Damascus. Many scientists were involved in the construction of these observatories under the leadership of Ahmed Farghani, who was in the service of al-Ma'mun.

Ahmad Farghani was in charge of the administrative work of the observatory in addition to conducting scientific work at the Baghdad observatory. During this period, Ahmed Farghani participated in the translation of works from Greek to Arabic. In his "Introduction to Sky", Scientist studied the views of Ptolemy and other Greek scientists on the subject and systematically presented the current knowledge of catastrophism, while criticizing a number of previous scholars, including Ptolemy.

Ahmad Farghani created a new measuring instrument that measures the water of the Nile River. The systematic data of geographical coordinates compiled by Al-Ma'mun's astrologers mainly correspond to the period of observations on the catastrophe carried out in Baghdad (829 AD) and Damascus (832 AD). This information is known as "Ajjiz ul-Ma'mun al-mumtakhana". This work has not come down to us in its original form, but it had a great influence on the development of the science of astronomy and geography in the IX century. This is clearly seen in the works of scholars such as Ahmad Farghani and Mohammad Khorezmi. We know "Ma'mun Ziji" mainly through Ahmad Farghani's work "Book on the Complex of Celestial Movements and the Science of the Stars". It is considered to be one of the earliest works written in Arabic on the catastrophe.

Al-Farghani's "Planetary Science" ("A book about the complex of celestial movements and the science of the stars") was written around 824-855, and a manuscript copy of it is kept in the "Dar al-Kutub" library in Egypt. This work was published in Latin in 1669.



Thanks to this work of Ahmad al-Farghani, the concept of "Ma'mun's Tables" spread to Europe very early. This work of Ahmad Farghani was translated into Latin twice in the XII century, and into other European languages in the XIII century. In this work of the scientist, tools related to the catastrophe and the method of making a sundial are described. Ahmad Farghani's works were highly appreciated by many Eastern scholars during the author's lifetime, and they used them to create their works.

Ahmad al-Farghani constantly dealt with disasters and created a number of scientific and theoretical works that attracted the attention of the world of science. The scientist's "Kitobu amal ar-Ruho-mot", "Kitobu ilal-al aflok" ("The book about the causes that occur in the sky"),

“Al-madhal ila ilmi hay’at al-aflok wa an-nujum” (“The science of disasters and treatises such as Introduction to Astrology”) are among them.

According to some researchers, Ahmad al-Farghani was not only a scientific observer and researcher, but also created special equipment for the observatory. As a result of these works, the scientist and practicing engineer wrote two works of practical importance, such as “Al-kamil fi-usturlab” (“Perfect knowledge about astrology”), “Fi-sanat wa usturlab” (“On the art of making astrolabe”). From the topics and contents of the treatises, it is clear that Ahmad al-Farghani thoroughly knew the art and secret industry of drawing. Because the equipment is first drawn on paper, then it is formed as a body through practical work and experiments.

More specifically, Ahmed al-Farghani gained fame with his scientifically and theoretically excellent book “Fundamentals of Sky”. In the words of Academician T. N. Kori-Niyazi, this work is “a unique collection of astronomical knowledge (Hoshimov,&Safo Ochil,2010).

While observing the scientific-theoretical work of Ahmed Farghani, the owner of a great talent, we wrote comments on his book “Almajisti” dedicated to the science of catastrophes by a great scientist like Ptolemy, it can be appreciated that he added comments and appendices to it, as well as giving information about the structure of the calendar (Islamic calendar), and showing how to make a sundial.

Ahmad Farghani, who conducted research in “Baytul Hikma” until about 840, later continued deep scientific and practical work in Damascus and Cairo, gaining great fame with his effective work. Since then, interest in his works has continued throughout the world. As early as the XII century, Spanish scientists Gerardo of Cremona and John of Seville translated his book “The Method of Astrology” from Arabic into Latin.

Al-Farghani was known to the world by the name “Alfraganus” given to him by translators. His work, translated into Latin and other Western languages, has been the main manual of catastrophism in Western Europe for four hundred years.

Christopher Columbus in 1492, during his trip across the oceans of the world with three ships under the leadership of the ship “Santa Maria”, he specially recognized the extensive use of al-Farghani’s world map (Umarova, 2022).

It should be noted that Ahmad al-Farghani's book “On the Complex of Celestial Movements and the Science of Stars” is his main work on astronomy. This work is also called “Fundamentals of Astronomy”. In this book, al-Farghani organized the astronomical knowledge of his time, enriched it with new information, gave a description of astronomical instruments and the structure of the sundial. According to the tradition of that time, he divided the countries into seven climates and gave the geographical coordinates of the places from east to west. This work is considered one of the first treatises on astronomy written in Arabic. An encyclopedia of astronomical knowledge, this work served as the primary reference to pre-Copernican astronomy in Europe.

It is known that in the Middle Ages it became a tradition to study the countries of the world into seven climates. The concept of the seven countries of the ancient Iranians was transferred to the history of astronomy and geography.

In the theory of seven climates, countries are divided into seven climates, starting from the east. The areas of each climate were studied separately. Ahmad Farghani also studied and investigated countries in this way. In the table he made, the provinces are listed in a certain sequence from east to west.

It should also be said that the first of the geographical works written in Arabic in the Middle Ages was al-Khorezmi's "Kitab surat-ul-arz". In it, al-Khwarizmi described seas, countries, mountains, rivers, lakes and cities in seven climates. In doing so, he continues the description from the westernmost point of the rubi-i-mamur, that is, to the Atlantic coast of Africa, that is, to the islands of Japan in the Pacific Ocean. The description extends in latitude from the equatorial lands to the northern polar lands.

Al-Farghani's description of climates differs from al-Khorezmi's. Al-Khorezmi is based on the Ptolemaic tradition in his method of description, while al-Farghani, based on the Hindu tradition, begins his description of the rubi al-mamur at the easternmost point. In his description of climates, the description of climates 3, 4, 5, 6 and 7 is noteworthy. Because they describe the cities and regions of Central Asia and adjacent lands (Umarova,2021).

Therefore, here is a passage containing those descriptions: **The third climate.** Starting from the east, it passes through the north of the country of China, then the country of India, and then the provinces of Kabul and Kerman.

The fourth climate. It starts from the east and passes through Tibet and then Khurasan, where there are cities of Khojand, Ushrushona, Ferghana, Samarkand, Balkh, Bukhara, Herat, Amuya, Marvarrud, Marv, Sarakhs, Tue, Nishapur. After that, it passes through Jurjon, Qumis, Tabaristan, Demovand, Qazvin, Dailam, Ray, Isfahan.

The fifth climate. In the east, it begins in the country of Yajuj, then passes through the north of Khurasan, in which there is the city of Toroz - a city of merchants, Navokat (Navkat), Khorezm, Isfijab (Sayram), Turar-band (Otror - now Aris) and Azerbaijan, Arminia (Armenia) province, Barda'a (Barda), Nashava (Nakhchivan).

The sixth climate. It starts from the east and passes through the country of Yajuj, then through the Khazar country (North Caucasus and the lower Volga), crosses the middle of the Jurjan (Caspian) sea and goes to the country of Rum (Byzantium).

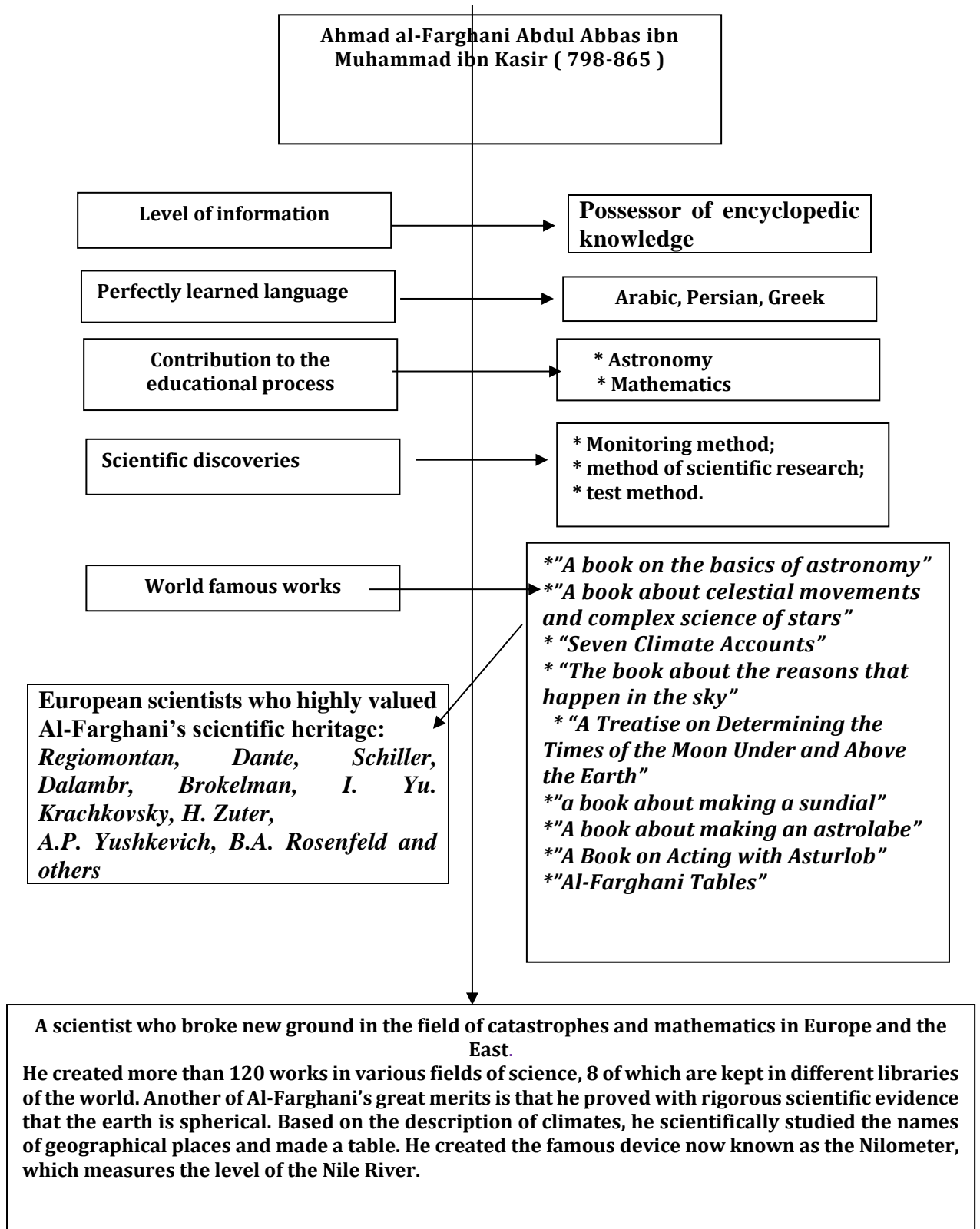
The seventh climate. In the east, it starts from the north of the country of Yajuj, then from the Turkic countries (Central Asia), then from the north of the Jurjan Sea, then crosses the Rum Sea (Black Sea), passes through the land of the Slavs, and ends at the Western Sea (Atlantic).

From the quoted passage it appears that Although al-Farghani described a large area of land, he described his original homeland Mowarounnahr in more detail. In addition, it should be noted that al-Farghani's vision of the rubi administrator is quite clear and free from all kinds of myth. For example, he did not refer to the land of Yajug as a mythical land in the East, but to a specific geographical area corresponding to the east of present-day Mongolia and northeast China. The calculations performed by Ahmed Farghani, whether they related to mathematics, astronomy, or geography, were extremely thorough, accurate, and perfect. Ferghani al-Khorazmi wrote comments on "Ziji".

Several generations of astrologers became scientists after reading Ahmed Farghani's works. Beruni, Ulug'beks used Ferghani's works in their scientific activities.

Al-Farghani's works on astronomy and mathematics, ibn Sina's philosophy, al-Khwarazmi and al-Biruni's works on astrology, algebra and medicine, and Ibn Rushd's teachings ignited the torch of superstition in Europe.

Chart 3



4 Conclusion

In conclusion, it should be said that Ahmad Farghani was the most powerful and powerful manifestation of the early Renaissance in the history of mankind, and as one of the founders of the fundamental science of his time, he had an incomparable influence on the development of the worldview and spirituality of mankind. "It is well known through historical sources that his invaluable legacy served as a program for the scholars of his time. The fact that Scientist's work entitled "Book on the Fundamentals of Astronomy" was translated into Latin and Hebrew as early as the twelfth century is a proof of this opinion" (Karimov,2008).

In general, Ahmal Farghani gained a great reputation in the field of science, mathematics and geography as a great astronomer due to his tireless and effective scientific work and activity. Moreover, he was known and famous as "Hajib" (mathematician) in Eastern countries, and "Alfraganus" in Western countries. Therefore, the famous scientist **Regiomontane**, one of the great representatives of the European Renaissance, gave lectures on astronomy from the books of al-Farghani at Austrian and Italian universities in the XV century. **Dante** (XV century) and **Schiller** (XVIII century) also mentioned Al-Farghani's name.

Currently, al-Farghani's books and treatises that have reached us are kept in the libraries of the world. **For example**, the manuscripts of "**The Book on the Basics of Astronomy**" are available in almost all libraries of the world. "**Book about Asturlobyasash**" - manuscripts in the libraries of Berlin, London, Mashhad, Paris and Tehran, "**Book about practice with Asturlob**" - a single manuscript in Rampur (India), "**Al-Farghani Tables**" - manuscript in Patna (India), "**Treatise on determining the times of the moon under and above the Earth**" - manuscripts are kept in Gotha and Cairo, "**book on making a sundial**" - manuscripts are kept in Aleppo and Cairo. The work "**Al-Khorazmi's justification of the theoretical views of Zij**" is mentioned by Berunitomani, but the manuscript has not been found.

From **European scientists** Dalamb, Brokelman, I. Yu. Krachkovsky, H. Zuter, A. P. Yushkevich and B.A. Rosenfeld **highly appreciated al-Farghani's work**.

In fact, as stated by our President Shavkat Mirziyoyev, "... Muhammad Khorazmi Ahmad al-Farghani, Abu Rayhan Beruni, Abu Ali ibn Sina, Mirzo Ulugbek, Alisher Navoi and many other geniuses are rightly written in golden letters in the history of not only Islam, but also world civilization" (Mirziyoyev, 2017).

After all, Ferghani's name is famous all over the East and West, like Khorezm. As a scientist who made a great contribution to the development of natural-scientific knowledge in the Middle Ages, he is mentioned and studied with great pride and pride in the sources, in the works of recent Western and Eastern authors, especially in his country Uzbekistan, and today streets and educational institutions are named after him. In 1998, by the decree of the First President of the Republic of Uzbekistan, the 1200th anniversary of the saint's birth was celebrated with great festivities. Magnificent statues were erected in his honor in Ferghana and Cairo.

While observing the scientific-theoretical work of Ahmad Farghani, a very talented person, he wrote comments on the book "Almajisti" dedicated to the science of catastrophes by a great scientist like Ptolemy, added comments and appendices to it, and also gave information about the structure of the calendar (Islamic calendar) and showed how to make a sundial.

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