



## **SCIENCE AND ASTRONOMY: INTELLECTUAL REFLECTIONS OF AL-BIRUNI**

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### **ABSTRACT**

Abu Raihan Muhammad Ibn Ahmad al-Biruni (973 A.D.-1048 A.D.) is one of the greatest scientists of Islam who opened a new era of independent research and scientific discoveries, and at the end of the day he became one of the greatest of all times. It is hardly possible to confine al-Biruni to any branch of scientific knowledge, since his genius astonishingly mastered the vast range of science subjects of astronomy, mathematics, chronology, mathematical geography, physics, chemistry, mineralogy, precious stones, pharmacy, geology, botany, etc., etc.,. Although it is argued that almost half of his works largely encompasses the various areas of astronomy and related areas. One of his major works on astronomy is *Kitab al-Tafhim li Awa'il Øana'at al-Tanjim* (The book of Instruction in the Elements of the art of Astronomy) which consists 530 babs (sections). This book covers the information on geometry, arithmetic, geography, pure astronomy, geography, astrological astronomy, chronology, astrolabe, signs of astrology, planets, divisions of signs, judicial astronomy and so on. Moreover, he scholarly describes his view on astrology and validity of the verdicts of astrological calculations. Another major work of al-Biruni on astronomy is *Qanun al-Mas'udi*, which provides substantial information about the knowledge of astronomy and mathematics possessed in that time. This paper will focus on an analytical study of al-Biruni's invaluable contributions towards science, especially to astronomy, his scientific method along with an exploration to his stand on the findings of astrological computations.

**Keywords:** Al-Biruni, Astronomy, Astrology, Science and contributions

### **INTRODUCTION**

The greatness of one's contributions can be measured by its unique survival through the centuries and its influence upon later generations and discoveries. In this case, the incredible immensity of the al-Biruni's contributions, which



maintain the high rank beyond the distance of one thousand years, attracts attention of academic and intellectual deliberations. Abu Raihan Muhammad Ibn Ahmad al-Biruni (973 A.D.-1048 A.D.) is one of the greatest scientists of Islam who opened a new era of independent research and scientific discoveries, and is being acknowledged as one of the greatest scientists by East and West.

It is hardly possible to confine al-Biruni to any branch of scientific knowledge, since his genius astonishingly mastered the vast range of science subjects of astronomy, mathematics, chronology, mathematical geography, physics, chemistry, mineralogy, precious stones, pharmacy, geology, botany, etc., etc.,. His untiring longing for knowledge enabled him to conquer the sciences of East and West, to grasp and comprehend them and convert them into a language that was then globally understood. Moreover, he was addressed by historians as the “scholar of humanity”, since he concerned more to disseminate advantageous knowledge to the lives of people and to solve their problems.

This paper will focus on the scientific contributions of al-Biruni with a special reference to astronomy and an analysis of his scientific method. Concerning the current debate of Islam v/s science, it includes a description of Islamic worldview of science. Moreover, it attempts to assess the view of al-Biruni towards astrology and his belief of verdicts of astrological calculations.

### **SIGNIFICANCE OF THE STUDY**

To look back to the pioneers who have fired up the light of civilization, especially for who walk in the flame of that fire, is a compulsory task in a way or another. Beyond the passage of more than a millennium after the demise of al-Biruni who augmented this world with his presence and discoveries, his achievements and scientific discoveries remain relevant and become the venues of further discoveries. The revisit of history and contributions of al-Biruni and his like luminaries provides an avenue of research in which the integration of religious excellence and scientific discovery is strong and unambiguous.



The significant importance of this study can be comprehended when we understand the philosophy of postmodernism (or cultural mood of our “times”) and its adverse consequences. It is argued that the position of postmodernism as “incredulity towards metanarratives”<sup>1</sup> of legitimation, is built upon the agenda of making discredit of religion, desertion of truth, the embracing of nihilism, multiplied skepticism and challenging the concept of God. Here, the pathway paved by al-Biruni, which continues to act as an immortal guide for countless generations in the history, distinguishes the grain and chuff of the science and its philosophy. Moreover, in the competence of frequent debates about Islam versus Science, to remind the proponents of this debate as well as ourselves about the contributions of Muslims towards science and technology will be beneficial in many respects. But it should be well taken that more than mere boosting of past, it is imperative to answer the question of how to ensure the original follow-ups of past contributions fitting to contemporary world and its needs.

### **AL-BIRUNI: A DEDICATED GENIUS OF KNOWLEDGE**

Al-Biruni can be entitled truly as an intellectual who made the fullest use of his faculties and carved out an abiding place in the history as a mathematician, an astronomer, a philosopher, a sociologist, and historian who also embarked on geography, medicine, physics and numerology. He was born in 4<sup>th</sup> September 973 A.D. (3<sup>rd</sup> of Dhu al-Hijjah 362 A.H.) in Birun, which was in Sind a beautiful town and died in 1048 A.D. at the age of 75.<sup>2</sup>

His work area was majorly associated with court of Sultan Mahmud Ghaznawi, one of the famous Muslim kings of 11 century A.D. Al-Biruni followed

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<sup>1</sup> Jean-Francois Lytord, *The Postmodern Condition: A report on knowledge*, vol.10, (USA: University of Minnesota, 1984), xxiv.

<sup>2</sup> There are different opinions about his date and place of birth. Some scholars say that he was born at Khiva in Uzbekistan while some other authority maintains that he was born in Khawarizm in Central Asia. For more details see, G. Allana, “Abu Raihan Muhammad Ibn Ahmad al-Biruni: A Restless Genius in Search of Knowledge”, *Al- Biruni: Commemorative Volume*, (Hakim Mohammed Said, ed.), (Karachi: Hamdard Academy, 1973), pp. 149-157.



Sultan Mahmud to India several times and thus he had an opportunity to travel all over the India during the period of 20 years and he recorded his observations in his well-known book *Kitab al-Hind*. In this period of 20 years, he learnt Hindu philosophy, mathematics, geography and religion from Pandits, to whom he taught Greek and Arabic science and philosophy.<sup>3</sup>

It is also worth mentioning that al-Biruni's time was enriched with many luminous Muslim figures of like Firdawsi (973 A.D.-1020 A.D.), Hakim Abu Ali Sina (980A.D.- 1037 A.D.), Ibn al-Haitham (965 A.D.-1039 A.D.), Abu al-Ala al-Ma'ari ( 937 A.D.-1057 A.D.), Abu al-Taiyib al-Tabari (960 A.D.- 1058 A.D.), Hakim Nasir Khusraw (1003 A.D.- 1060 A.D.), al-Mu'ayyad fi al-Din al-Shirazi (999 A.D.- 1065 A.D.) and many others.<sup>4</sup>

His important books are *Kitab al-Hind* (History and Geography of India), *Qanun al-Mas'udi* (Canon Masudicus), *al-Athar al-Baqiah* (Ancient history and Geography), *Kitab al-Saydanah* (Materia Medica), *Kitab al-Jawahir* (Precious Stones), *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim* (The book of Instruction in the Elements of the art of Astronomy). Because of al-Biruni's profound intellectual capacity and understanding that faith can never be hurdle in one's pursuit for knowledge and truth, he was admired even by Western scholars like Dr. Edward C. Sachau, De Boer, Carra de Vaux, Nallino, Raymond Beazlay and others.<sup>5</sup> George Sarton in his "Introduction to the History of Science" comments upon al-Biruni: "He was one of the greatest scientists of Islam, and all considered, one of the greatest of all times".<sup>6</sup>

## **ISLAMIC WORLD VIEW OF SCIENCE**

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<sup>3</sup> Mazhar M. Qureshi, Introduction to Muslim Contributions to Science and Technology, (New Delhi: Adam Publishers & Distributors, 2006), p. 65.

<sup>4</sup> G. Allana, "Abu Raihan Muhammad Ibn Ahmad al-Biruni: A Restless Genius in Search of Knowledge", *Al-Biruni: Commemorative Volume*, (Hakim Mohammed Said, ed.), (Karachi: Hamdard Academy, 1973), pp. 151-152.

<sup>5</sup> Ibid, p. 153.

<sup>6</sup> George Sarton, *Introduction to the History of Science*, (Melbourne: Krieger Pub Co, 1975).



Travelling was described as inevitable attribute of Muslims in their way of life in the early period of Islam. They were passing through plains, hills, rivers, oceans, deserts and forests in order to fulfill their various necessities of hajj, jihad, trade, etc. These expeditions converted historically and literally as the venues of incredible experiments, and later history called it scientific achievements. Moreover, these scientific accomplishments stimulated in them a quest of investigation of knowledge on social, political, historical, geographical, economic, agricultural and other situations of the land they came across. Later, they developed their ideas to defined facts of physical (qualitative) and mathematical (quantitative) aspects of science; and, in short, they became renowned scientists.<sup>7</sup>

After the establishment of many academies for the work of translation of main Greek works on philosophy, astronomy, mathematics, medicine and other sciences, the Muslim rulers set up many observatories, laboratories from where Muslim scientists discovered many scientific realities and instruments. The role of Caliphs, governors and government officials of Islamic state in the promotion of scientific learning in the Muslim world is really undeniable. The intellectual activity was accelerated due to fact that regularly the rulers and their high officials themselves used to be great scholars, and it was not easy for any scholar to have an access to them, unless he was well versed in a science.<sup>8</sup>

Here, it is worthy mention that there is wide spread notion that Islam is against science and independent research while this idea is totally based on false understanding and misinterpretations of Islamic attitude towards science. Mohammed Iqbal clears the reality:

But the point to note is the general empirical attitude of the Quran which engendered in its followers a feeling of reverence for the actual and ultimately make them the founders of modern science. It

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<sup>7</sup> Mazhar M. Qureshi, *Introduction to Muslim Contributions to Science and Technology*, (New Delhi: Adam Publishers & Distributors, 2006), p.32.

<sup>8</sup> *Ibid*, 32-33.



was a great point to awaken the empirical spirit in an age which renounced the visible as of no use in men's search after God.<sup>9</sup>

According to Iqbal, the West purposefully kept hiding the pioneering role of Muslim scientists towards the development of science.<sup>10</sup> Iqbal's view was supported by other scholars realizing that the root of modern science belongs to Muslims at a time when Greeks were unaware of this scientific method. Briffault explained:

Science is the most momentous contribution of Arab civilization to the modern world; but its fruits were slow in ripening. It was not science only that brought Europe back to life. Other and manifold influences from the civilization of Islam communicated its first glow to European life.<sup>11</sup>

In addition, Bertrand Russel points out to the truth that Arabs were more experimental than Greeks, especially in chemistry. In the period of Dark Age Arabs were carrying the tradition of civilization from which Christians such as Rogern Bacon acquired whatever scientific knowledge the later Middle ages possessed.<sup>12</sup>

But the difference between the worldviews of Islam and West lies in the foundation of scientific observation. Islam emphasize the methodology based on revelation, observation, experiment, thinking which leads to knowledge i.e. science.<sup>13</sup> At the same time, west tries its best to cut off the hand of God from any influence on their observation or discoveries.

## **THE SCIENTIFIC METHOD OF AL-BIRUNI**

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<sup>9</sup> Mohammad Iqbal, *The Reconstruction of Religious Thought in Islam*, (New Delhi: Kitab Bhavan, 1994), p. 14.

<sup>10</sup> For more details, Muhammad Mumtaz Ali, *The Philosophy of Science: Western and Islamic Perspectives on Certain Aspects*, (Kuala Lumpur: Thinker's Library Sdn. Bhd.) pp. 35-40

<sup>11</sup> Mohammad Iqbal, *The Reconstruction of Religious Thought in Islam*, p. 130.

<sup>12</sup> Bertrand Russel, *The Scientific Outlook*, (London: Routledge, 2001), pp. 5-6.

<sup>13</sup> Muhammad Mumtaz Ali, *The Philosophy of Science: Western and Islamic Perspectives on Certain Aspects*, p. 49.



Al-Biruni literally mastered all the branches of science known in his time and marked his own bright reflections in each one. That is why he was not unaware of philosophy and speculative disciplines while he focused his major works towards the study of observable phenomena, in nature and in man. In between, he emphasized in astronomy, astrology and related subjects which were won more attraction in the scientific researches of his period. Speculation could not attain a role in his thinking; he was in full command of the best scientific theories of his time.<sup>14</sup>

He had strong fondness for the direct and personal investigation of natural phenomena, exercised at times under very demanding circumstances. Moreover, he spent himself in the inventing and developing of instruments and flair for accuracy in observations in order to meet the realities. Because of quest for accuracy and reasonable panic of losing exactness in the track of calculations, he predisposed to prefer observational methods that yielded straight results, as against techniques requiring extensive deduction by computation.<sup>15</sup>

Mazhar M. signifies to a typical example of his use of experimental scientific methods:

... the description of his classical experiment carried out at Fort Nandana (Distt: Jhelum, Pakistan) whereby he deduced the measure of the earth's circumference, arriving at a figure of 24, 778 English miles, which differs by only 0.3% from the presently known value. An excellent account of the site and the actual measurement and calculations is given by N.A. Baloch in his monograph "Beruni and his Experiment at Nandana".<sup>16</sup>

Amid this way of thinking, he kept in mind the role of revelation, and applied the methodology based on revelation, observation, experiment, thinking which leads to knowledge i.e. science. The integration of religion (or revelation)

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<sup>14</sup> Mazhar M. Qureshi, Introduction to Muslim Contributions to Science and Technology, p. 43; C.C. Gillispie,(1971), Dictionary of Scientific Biography, Vol.2, pp. 151-155.

<sup>15</sup> Ibid

<sup>16</sup> Ibid, p. 44.



can read conspicuously in his achievements, for example, in conclusions about the verdicts of astrological calculations.

### **SCIENTIFIC CONTRIBUTIONS OF AL-BIRUNI**

There is a vast treasure of knowledge and scientific achievements left by al-Biruni after his life of 75 years. Later, much modern scientific knowledge is made upon the works of al-Biruni. Ghulam Rabbani Aziz tries to count some of his significant contributions towards scientific knowledge:

1. Trisection of an angle, and solution of some complex problems without the use of protractors and scale.
2. Accurate determination of latitude and longitude of a large number of places.
3. Pointing to the existence of the American continent.
4. Determination of specific gravity of 18 precious stones and metals.
5. Providing proof that light travels at a much faster speed than sound.
6. Explaining the forces of gravity.
7. Discussion on the issue whether the earth revolves round its axis or not.
8. Explaining on the universal law of nature that flowers have always 3,4,5,6, or 8 petals and never 7 or 9.
9. Determination of the circumference and diameter of the earth by using spherical trigonometry.
10. Determination of sun's declination and zenithal movement.<sup>17</sup>

The abovementioned scientific reflections are only few from the list of al-Biruni. There is another listing which shows the significant works of al-Biruni as over a hundred books. The list as included by Sachau in the German Introduction to his edition of *al-Athar al-Baqiah*, comprises:<sup>18</sup>

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<sup>17</sup> Ghulam Rabbani Aziz, "Al-Biruni and His Academic Conquests", *Al-Biruni: Commemorative Volume*, (Hakim Mohammed Said, ed.), (Karachi: Hamdard Academy, 1973), pp. 158-159.

<sup>18</sup> Dr. K. B. Nasim, "Al-Biruni as an Astrologer", *Al-Biruni: Commemorative Volume*, p. 578.



No	Area of Works	Number of Works
1	Geometry, Astronomy, etc	18 works
2	Geography	15 works
3	Arithmetic	8 works
4	Light	4 works
5	The Astrolabe	5 works
6	Times and Seasons	5 works
7	Comets	5 works
8	Stations of the Moon	12 works
9	Astrology	7 works
10	Persian and other Tales	13 works
11	Religion	6 works
12	Books of which the author retained no copy	5 works
13	Unfinished books	10 works
	Total	113 works

The above mentioned list of his contributions and area of researches are self explanatory of his incredible mastership in science and its different branches.

### **AL-BIRUNI AS AN ASTRONOMER**

It can be easily understand that astronomy has a special space in the works of al-Biruni and almost half of his works are related to astronomy, astrology and related branches of science. Al-Biruni has two major works with same title "كتاب التفهيم لاوائل صناعة التنجيم", *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim* (The book of Instruction in the Elements of the art of Astronomy); one is in Arabic and other in Persian.



M. S. Namus (1973) offers some basic information about the book of *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim* (Arabic book, which is written in Ghaznah, 1029 A.D.):

The total Babs (باب) singular; (أبواب) plural: Sections in the original text, is 530. The translator R. Ramsay<sup>19</sup> Wright has divided these 530 paragraphs according to modern methods into 13 chapters. The related paragraphs have been placed under one chapter. The book has been divided into two major parts: Astronomy: Paras 1-346 in Arabic original, Astrology: Paras 347-530 in Arabic original.<sup>20</sup>

If we go through his each section thoroughly, it will be concluded easily that only an author who mastered and convinced this subject originally can come up with such a deep analysis of astronomy. The thirteen chapters of Arabic book are as following:<sup>21</sup>

1. Astronomy with details to the Geometry
2. Arithmetic (Arithmetical operations, Decimal notation, Algebraic representation of numbers by letters)
3. Pure astronomy (spheres, stars, planets, ecliptic...)
4. Geography (Earth, seven climates, Cities in seven climates)
5. Astrological astronomy (Co-ascensions of Equinoctial and Ecliptic, ascendant houses...)
6. Chronology (Solar and lunar years, various nations, their dates, cycles...)
7. Astrolabe (parts, kinds, uses)
8. The signs of Astrology (their nature and characteristics influence on figure, face, profession...)
9. The planets (their nature and characteristics, their years, indications of soils, buildings, countries...)

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<sup>19</sup> R. Ramsay Wright, M. A. Edin., LLD. Tor. And Edin. Emiretus Professor of Biology, University of Toronto; 1934, London, Luzac & Co. 46, Great Russel Street.

<sup>20</sup> M. S. Namus, "Al-Biruni: The Greatest Astrologer of the Times", *Al-Biruni: Commemorative Volume*, p. 546.

<sup>21</sup> For more details: M. S. Namus, "Al-Biruni: The Greatest Astrologer of the Times", *Al-Biruni: Commemorative Volume*, pp. 545-557.



10. Division of Signs (Faces, Decenates, Ptolemy's Thirds, Terms and their Lords...)
11. The houses (Tables of indications of Nativities; at Horary Questions: as to Organs...)
12. The part of fortune (relative positions of planets and sun...)
13. Judicial astronomy (the five divisions and their astrological principles, Lord of the year...)

It will be beneficial to include here, the translation of introduction written by al-Biruni in the beginning of Persian book of *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim* in the second page of the body of the book:

By this subject we understand the nature of the universe, the causes and reasons of the nature of the sky and earth, and what is in between these two. We do this by our observation and by following the conclusions of the great masters. These things are very useful in the profession of astrology.

For this reason it is necessary for the learner to make his ear familiar with names and words which the astrologers make use of, in practice. As the mind of learner comes back from the abstract discussions of reasons and causes of the fundamentals, it becomes easy for the student to give necessary shape to the meaning of the subject. His doubts are cleared and his thinking faculty is ripened. And the grief which he would encounter by not following those lines of instructions does not collect round him on all sides.

According to the special request of Rai'Énah bint ×usayn al-KhawÉrizmÉ, I have compiled this memorial present. As she desired it, the book has been written in the form of questions and answers, which is a better way of explanation; and an easier form to put down on paper and to understand.

I have started with Geometry. Then I have given the methods of calculation; then the form of universe, then the laws of astrology. I have done this with the purpose that no person is fit for being called Munajjim (astronomer) unless he learns thoroughly these four branches of learning.<sup>22</sup>

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<sup>22</sup> Ibid, p. 550.



Al-Biruni was very proficient in geometry, arithmetic, cosmography and judicial astrology. He emphasizes the importance of these four branches in astronomy as he points out in the first chapter of *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim*: "A man does not merit the title of astronomer until he has attained proficiency in four sciences; viz., first, Geometry; secondly, Arithmetic; thirdly, Cosmography; and fourthly, judicial astrology."<sup>23</sup>

*Qanun al-Mas'udi fî al-Haiy'ah wa al-Nujum*, another of book of al-Biruni on astronomy, has also much importance in the scientific references. This book was dedicated to Sultan Mas'ud. This book discusses several theorems of astronomy, trigonometry, solar, lunar, and planetary motions and related topics.<sup>24</sup> This book is considered as the largest and most important of al-Biruni's mathematical, geographical and astronomical studies. It is a work which is a most all-embracing astronomical encyclopedia, "slightly short of 1,500 pages, in which he determines the motion of the solar apogee, corrects Ptolemy's findings and is able to state for the first time that the motion is not identical to that of precession, but comes very close to it."<sup>25</sup>

Al-Biruni applied mathematical techniques which were unknown to his ancestors for example the analysis of instantaneous motion and acceleration, described in terminology that can best be understood if we assume that he had "mathematical functions" in mind. "In the 18<sup>th</sup> section of the *Qanun*, al-Biruni presented a masterly exposition of both the solar as well as the lunar eclipses, specially the section dealing with al-kusufin (the images of the eclipses) which pass on the faces of the sun and the moon without affecting their body; he referred in his letter to a book on the two united and equal axes."<sup>26</sup>

## **AL-BIRUNI'S VIEW OF ASTROLOGY**

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<sup>23</sup> K. B. Nasim, "Al-Biruni as an Astrologer", *Al-Biruni: Commemorative Volume*, p. 580.

<sup>24</sup> Mazhar M. Qureshi, Introduction to Muslim Contributions to Science and Technology, p. 65.

<sup>25</sup> <http://english.islammassage.com/ArticleDetails.aspx?articleId=767>. Retrieved Jan 19, 2014.

<sup>26</sup> Ibid.



Astrology is the study of the connection between the movements of the stars and their influence on individuals and events. From the Islamic perspective, astrology can be divided into two branches - polytheistic and lawful. The polytheistic astrology can be defined argument of that the stars and planets have such high-handed power that they can turn people's life and fortunes. It also believes a relationship between stars, planets and events that take place on Earth by which, the future can be predicted.<sup>27</sup> This kind of astrology is prohibited in Islam as it contradicts with basic beliefs of Islam. The lawful one is the scientific study of stars for determining and fixing time division such as months and seasons and determining and fixing compass directions. In our times it is widely addressed with the name of "astronomy". It is lawful because it is applied by the senses and fixed calculations, which can help determine the times of prescribed prayers, and other religious duties that should be observed at certain times.<sup>28</sup> Quran guides: "And landmarks (sign posts during the day) and by the stars (during the night), they (mankind) guide themselves." [16:16]

Al-Biruni has limited precisely the capacity, power and influence of the verdicts of astrology; and at the same time he has confined it in the activities of the material universe which is made up of the four elements: water, air, fire, earth. The world beyond this material universe, the spiritual world, the internal workings of human mind are beyond the scope of astrology. This is the field of sorcerer not of astronomer.<sup>29</sup> Al-Biruni says in page 29 of *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim*:

... astrology reaches a point which threatens to transgress its proper limits, where problems are submitted which it is impossible to solve for the most part, and where the discussion leaves the basis of material universe, and enters to intricacies of unknown worlds. When this boundary is crossed, the astrologer remains behind on

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<sup>27</sup> <http://sunnahonline.com/library/beliefs-and-methodology/101-astrology>. retrieved Jan 18, 2014.

<sup>28</sup> Ibid.

<sup>29</sup> M. S. Namus, "Al-Biruni The Greatest Astrologer of the Times", *Al-Biruni: Commemorative Volume*, pp. 552.



one side and you meet the sorcerer who stands on the other side of boundary. The field of the sorcerer is active with omens and divinations, which has nothing to do with astrology; although the sorcerer to hang a coloured curtain, makes references of planets and stars in connection with his verdicts.<sup>30</sup>

Aqa'i Jalal Huma'i, who edited the Persian edition of *Kitab al-Tafhim li Awa'il Sana'at al-Tanjim*, explains the perspective of al-Biruni upon the verdicts of astrology as "He has repeatedly explained his unbelief in the verdicts of astrology, and loose and frail, and perturbed estimations of this art." In the book, al-Biruni says (in page 360), "the foundation of this art is placed on frail principles, and perturbed estimations". From the abovementioned quotations of al-Biruni and the observations of scholars who studied him and his works, we can conclude in his stand of refutation in the blind belief of astrology. It is a sufficient evidence for a better conviction about astrology and belief of its verdicts not only for him but also for all people, since he spent so much time on the study of Greek and Indian astrology and mastered all its areas.

## CONCLUSION

A serious analytical study about the scientific contributions of al-Biruni is still relevant since many of his discoveries are being included in other scientists' achievement lists. For example, Galileo and Newton highly admired when they wrote about earth and the theory of gravity in seventeenth century. But, the foundation of this knowledge was laid by al-Biruni seven hundred years ago, while this reality was unknown purposefully or out of ignorance. Majority of people don't know that Galileo's telescope was an improved version of al-Biruni's Ustarlab, which was used for calculating the movement of the celestial bodies.<sup>31</sup> Along with the revisiting of great scientists of medieval Islam, it should be

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<sup>30</sup> Ibid, p. 552.

<sup>31</sup> G. Allana, "Abu Raihan Muhammad Ibn Ahmad al-Biruni: A Restless Genius in Search of Knowledge", *Al-Biruni: Commemorative Volume*, p. 153.



ensured the active participation of the present generation to connect the past with present in a proper and productive way in order to march confidently towards a better future.

Al-Biruni has developed an organized scientific method by which he has presented many astonishing discoveries and marked authentic observations in almost all branches of science known in his period. By just having a look to his two books on astronomy will be sufficient to be convinced of his thorough mastership of the field, perfectness of the details and incredible scientific initiatives. Moreover, it is noteworthy that all his observations still keep it relevance and authenticity. In addition, his remarks about the validity of astrological calculations are in compliance of Islamic rulings and indisputably sound.

## **BIBLIOGRAPHY**

Al-Biruni , Abu Raihan Muhammad Ibn Ahmad. (1934). *Kitab al-Tafhim li Awa'il San'ah* translation in English by R. Ramay Wright; London, Luaz and Co. (relied upon *Al-Biruni: Commemorative Volume*, 1973)

Al-Biruni , Abu Raihan Muhammad Ibn Ahmad. (1934). *Kitab al-Tafhim li Awa'il Sana'ah al-Tanjim*; in Persian; edited by Aqa'i Jalal Huma'i; Tehran: Majlis Press, 1936 Persian Solar.

Al-Biruni, Abu Raihan Muhammad Ibn Ahmad. *Qanun al-Mas'udi. In two volumes, Hyderabad: Dairat al- Ma'arif al-Osmania.*

Bertrand Russel. (2001). *The Scientific Outlook*, London: Routledge.

Lytord, Jean-Francois. (1984). *The Postmodern Condition: A report on knowledge*, vol.10. USA: University of Minnesota.



Mazhar M. Qureshi. (2006). *Introduction to Muslim Contributions to Science and Technology*. New Delhi: Adam Publishers & Distributors.

Mohammad Iqbal. (1994). *The Reconstruction of Religious Thought in Islam*, New Delhi: Kitab Bhavan.

Muhammad Mumtaz Ali. (2009). *The Philosophy of Science: Western and Islamic Perspectives on Certain Aspects*. Kuala Lumpur: Thinker's Library Sdn. Bhd.

Said, Hakim Mohammed, ed. (1973). *Al-Biruni: Commemorative Volume*. Karachi: Hamdard Academy.

Sarton, George. (1975). *Introduction to the History of Science*, Melbourne: Krieger Pub Co.

<http://english.islammessage.com/ArticleDetails.aspx?articleId=767>. Retrieved Jan 19, 2014.

<http://sunnahonline.com/library/beliefs-and-methodology/101-astrology>.  
retrieved Jan 18, 2014.

<http://english.islammessage.com/ArticleDetails.aspx?articleId=767>

<http://pu.edu.pk/images/journal/studies/PDF-FILES/Artical%20-%202010.pdf>