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ORIGINAL ARTICLE

Historical Analysis of the Sociopolitical Factors that Influenced Medieval Science

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ABSTRACT

The political power of the ruling aristocracies and the comparatively excellent scientific education during the medieval ages has undoubtedly fostered a keen sense of eagerness, inquisitiveness and an observant attitude towards the pursuit of scientific and technological discoveries. During the course of history, political rulers held science and technology in high esteem and invested considerable amount of financial and human resources to the development and advancement of science and technology because it is the key to social security, social progress and social stability. This paper presents a historical analysis of the sociopolitical factors that influenced medieval science with special emphasis on the sociopolitical factors that governed the scientific career of Abu Muhammad Ali ibn Ahmad ibn Sa'id ibn Hazm in medieval Islamic Spain.

Key words: Sociopolitical Perspectives, Historical Analysis, Scientific Education, Medieval Scholar, Technological Contributions

Introduction

Abu Muhammad Ali ibn Ahmad ibn Sa'id ibn Hazm was born on November 7, 994 and died on August 15, 1064. The Ibn Hazm family came from Cordoba, a city in southern Spain and the centre of Moorish culture. The great-grandfather of Ibn Hazm was converted to Islam from Christianity. Ibn Hazm's father who is Abu Umar Ahmad ibn Sa'id ibn Hazm (d. 1012) held the position of vizier (now known as Minister) at the court of Umayyad Caliph Hashim II (also known as Al-Mansur) (A.J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003).

The reign of Al-Mansur's was one of the greatest moments of Islamic Spanish history. He had led Muslim armies into victories of unprecedented scale against their Christian foes. Upon his death, the Islamic Empire was faced with intrigues, divisions, and conflicts between numerous factions and the once most powerful state collapsed into chaos, and was never recovered (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; N. Daniel 1975).

The Christian armies seized this opportunity of Al-Mansur's death to carve up the Islamic dominion. They gradually achieved this in two occasions. Firstly, during the Almoravid and secondly, during the Almohad intrusions, which slowed the Christian advance by about two centuries (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007). Early in the thirteenth, after the final defeat of the Almohads, Cordova, Valencia, Seville, and others Islamic strongholds all fell. Granada alone was to remain Muslim, until, it too, ridden with intrigues and disunity, finally fell in 1492. The Muslims were to be eliminated completely from Spanish soil not long after (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; Hazm 2007).

Ibn Hazm lived among the circle of the ruling aristocracy of the Umayyad government. Together with his excellent education at Cordoba, this experience gave him an eager, inquisitive and observant attitude (N. Daniel 1975; J. W. Draper 1875). As a result of his talent, he earned fame and served the Caliphs of Cordoba. Most especially, he was known to have worked under Al-Mansur Ibn Abi Aamir, Hajib (Grand Vizier) to the last of the Umayyad caliphs, Hisham III (S. Al-Hassani and S. Zaimeche 2003; N. Daniel 1975; Hazm 2007; J. W. Draper 1875).

After the death of the Grand Vizier al-Muzaffar in 1008, the Umayyad Caliphate of Spain became involved in a bloody civil war that lasted until 1031 resulting in the collapse of the central authority of Cordoba.

Ibn Hazm's father died in 1012, however Ibn Hazm continued to speak in favor of a centralized Islamic political structure which resulted in him being accused of supporting the Umayyads and as a result of this, he was unfortunately, frequently imprisoned (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; R. P. Scheindlin 1998). Ibn Hazm retreated to his family estate at Manta Lisham in the year 1031 as a result of the sociopolitical instability of the period, from there he produced a huge number of significant scientific and literary works (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; J. W. Draper 1875; C. Bennett 1992). According to one of his sons, Ibn Hazm produced 80,000 pages of writing which consists of 400 works but only 40 of those works are currently in existent. Ibn Hazm's literary work covers a diverse and impressive range of topics, namely; comparative religion, theology anthropology, jurisprudence, science, logic, history, and ethics (S. Al-Hassani and S. Zaimeche 2003; N. Daniel 1975; R.P. Scheindlin 1998). Also, he is fond of adventures and travels. Consequently, he wrote about his visit to the island of Majorca and its capital Medina Mayurqa near Palma and he gave an interesting and beneficial insight into the invention and construction of Caravels (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; R. P. Scheindlin 1998; P. Coles 1968).

Ibn Hazm life and thoughts is a good illustration and product of the chaos and collapse of the Islamic Empire. This collapse and political unrest had direct impact on him who was at the centre stage of events and made him a victim of unfortunate circumstances for certain periods of his life (P. Coles 1968). He held positions of power and prestige followed by demise and disgrace as a result of the political fortunes and misfortunes of his patrons. The upheavals of political career also accounts for his withdrawal from public life and devoting himself to study, teaching and writing (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; N. Daniel 1993). Conclusively, Ibn Hazm is a famous, revered and well-respected Islamic scholar and according to a saying of his period, "the tongue of Ibn Hazm was a twin brother to the sword of al-Hajjaj (a famous 7th century general and governor of Iraq)" (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; N. Daniel 1993; R. Arnaldez 1956).

Overview of Ibn Hazim's Contributions:

Ibn Hazm's vast and versatile erudition enabled him to extend his thinking to diverse areas of science. Therefore, in order to conduct a comprehensive study on his contributions, one has to be aware of the issues which Muslim thinkers have addressed (S. Al-Hassani and S. Zaimeche 2003; N. Daniel 1993; R. Arnaldez 1956). Apart from his scientific contributions, he was also revered as one of the most original theologians and literati of Muslim Spain and a master of reputable disciplines such as law, history, grammar, poetry, genealogy and logic (S. Al-Hassani and S. Zaimeche 2003; P. Coles 1968; R. Arnaldez 1956). Below are some of his major areas of contributions to knowledge.

Contributions to the Classification of Science:

His thoughts and philosophy on science also took another dimension. Customarily, Islamic scholars like Al-Ghazali classify sciences in order to provide some sort of division that helps in their understanding, study and promotion. This classification has gradually led to our modern learning system in departments, faculties, and courses. Science was a bulk of knowledge just like a precious stone mingled with rough metals and earth prior the Muslim classification (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; P. Coles 1968; R. Arnaldez 1956). Thus there was no distinct boundary, consequently making it easy to find a chemist dabbling into the field of a magician or a philosopher. It was extremely difficult to stop the non-scientific scholars from taking over the scientific fields. Hence, science was stagnated and diverted into inappropriate directions before the classification of science by Muslim scholars (S. Al-Hassani and S. Zaimeche 2003; N. Daniel 1975Ha; zm 2007; P. Coles 1968; R. Arnaldez 1956).

Ibn Hazm made a unique contribution to the classification of sciences by providing the boundaries and the rules within science as a whole. Moreover, he made an important contribution by providing the seeker of science indications of how to go on about it. He accomplished this by classifying and clarifying the highly complex, abstract, moral and down-to-earth topics such as the prudent conduct in scientific gatherings (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; P. Coles 1968; R. Arnaldez 1956).

Contributions to Natural Sciences:

Ibn Hazm made significant contributions to Natural Sciences (S. Al-Hassani and S. Zaimeche 2003; R. P. Scheindlin 1998; N. Daniel 1993). His contributions are scattered throughout his books and it needs to be collected together in a cohesive manner. However, some of his contributions to Natural Science can be found in his (1) Al-Taqreeb, (2) Al-Fassl Fil Milal, and (2) Response to Al-Razi (objecting to his views on the origin of the universe) (S. Al-Hassani and S. Zaimeche 2003; R. P. Scheindlin 1998; C. Bennett 1992; P. Coles 1968; R. Arnaldez 1956).

Contributions to the Science of Numbers and Geometry:

Ibn Hazm attributed special significance to the number 1. He claimed that 1 is not a number because there is no other number like it. He further supported his claim by saying that if you split 1, it becomes a fraction. Hence, it will lose its oneness (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; R. P. Scheindlin 1998). In the area of geometry, he defines the line as the ultimate edge of any surface and a point as the crossing between two lines. He also made scholarly remarks on the concept of infinity and the finite. He referred to the universe as limited and bounded because it was created and made of limited parts. He also referred to the present objects, living creatures and plants as limited while the ones which have not yet been created (such as humans who are not yet born) as unlimited (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; R. P. Scheindlin 1998; N. Daniel 1993; R. Arnaldez 1956).

Contributions to Dynamics and Astronomy:

A very interesting notion on the nature of motion of bodies is found in his work. He explained that there are mobile objects and stationary objects but there is neither motion nor stationariness. Ibn Hazm refuted astrologers who believed that stars and planets have souls and minds and can influence people (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; N. Daniel 1993; P. Coles 1968). He maintained that stars are celestial bodies with no mind or soul with no knowledge of the future and with no power to affect people. Furthermore, he says that their effect on people is through their physical characteristics just like the effect of the sun's heat and rays on the planets and the effect of the moon on the tides of seas. He explained that Saturn's orbit takes 33 years. Today's astronomy recognizes Saturn's orbit around the Sun (not the Earth) taking 29 years (S. Al-Hassani and S. Zaimeche 2003; R. P. Scheindlin 1998; C. Bennett 1992; P. Coles 1968; R. Arnaldez 1956).

He argued against those who believe that the Sun sets in one of the seas on Earth and questions the possibility of a larger Sun setting in a smaller Earth. He claimed that the Earth is spherical despite what is popularly believed, he proved this by explaining that the Sun is always vertical to a particular spot on Earth. He considered shooting stars to be hot fires that conglomerate into stars which eventually lose their light by burning. He challenged all theories on the age of the Earth, and argued that Muslims do not have definite knowledge of the age of the Earth and he concluded that it could be many multiples of the ages suggested by others (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; C. Bennett 1992; N. Daniel 1993; R. Arnaldez 1956).

Contributions to Physics and Life Sciences:

Ibn Hazm made similar discoveries to his contemporary Al-Hasan Ibn Al-Haytham (b. 965-1039). They proved that light is reflected from the object and passes through the eye which is a spherical hollow ball that has a sensitive inner service that detects the light (image). Also they proved that the angle of incidence equals the angle of reflection and they constructed a dark box with one pin hole on its side and called it camara now known as camera to prove this theory (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; J. W. Draper 1875; N. Daniel 1993; R. Arnaldez 1956).

His view on sound is that it travels at specific speeds he proved this, using some examples which includes reference to the interval between lightening and the thunder that follows it. In this, he implicitly believes that lightening causes thunder. Ibn Hazm expressed views on the development of life and species. He classified them into categories according to the process of their inception and development. He went into the details of various insects (such as lice and flies) and animals (such as frogs) (S. Al-Hassani and S. Zaimeche 2003; Hazm 2007; J. W. Draper 1875; C. Bennett 1992; P. Coles 1968; R. Arnaldez 1956).

His Magnum Opus: Earth's Sphericity:

He claimed that the Earth is spherical despite what is popularly believed. He proved this by explaining that the Sun is always vertical to a particular spot on Earth (R. Arnaldez 1956; M. Hamidullah 1982; D. A. King 1993). The explanation for this is that approximately half of the Earth is illuminated at any given time by sunlight. The area subjected to direct illumination is almost exactly half the planet; but because of atmospheric and other effects that extend the reach of indirect illumination, the area of the planet covered by either direct or indirect illumination amounts to slightly more than half the surface (D. A. King 1993; F. Fernández-Armesto 1974; J. S. Aber 2003).

The hemisphere of the Earth experiencing daytime at any given instant changes continuously as the planet rotates on its own axis. The axis of the Earth's rotation is not exactly perpendicular to the plane of its orbit around the Sun and so the length of the daytime period varies from one point on the planet to another (D. A. King 1993; F. Fernández-Armesto 1974; Mercier, P. Raymond 1992). Moreover, since the axis of rotation is

relatively fixed in comparison to the stars, it moves with respect to the Sun as the planet orbits the star. This creates seasonal variations in the length of the daytime period at most points on the planet's surface (J. S. Aber 2003; Mercier, P. Raymond 1992).

The period of daytime is roughly defined as the period between sunrise when the Earth's rotation towards the east first causes the Sun's disc to appear above the horizon to sunset when the continuing rotation of the Earth causes the Sun's disc to disappear below the horizon to the west (R. Arnaldez 1956; D. A. King 1993; J. S. Aber 2003). Furthermore, the Earth's atmosphere further diffuses light from the Sun and lengthens the period of sunrise and sunset, for a certain period after sunset and before sunrise, indirect light from the Sun lightens the sky on Earth; this period is often referred to as twilight (D. A. King 1993; J. S. Aber 2003; Mercier, P. Raymond 1992; Mohr, P.J.; Taylor, B.N. 2000).

Works of Ibn Hazm:

Ibn Hazm's works are numerous; the major ones are highlighted below:

Kitab al-Taqrīb: In this book, Ibn Hazm states that science entails knowing with certainty something according to what it really is or by an evident proof which helps reach certitude. Just like Descartes, He has a love for certainty, and like him seeks it in proof, suspecting that all edges away from proof becomes close to error (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956), (Ibn Hazm 1899, Ibn Hazm 1903). Ibn Hazm believed that science and knowledge have practical aims and they should be shaped and affected by revelation. Therefore, the object of science is to understand divine orders. He further mentioned that our faculties of discerning and comprehending should be used as God wishes us to and where He wants us to (S. Al-Hassani and S. Zaimeche 2003; R. P. Scheindlin 1998; P. Coles 1968; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903).

Regarding the role of experiment and observation in advancing science, Ibn Hazm explained that never could man have acquired the sciences and arts by himself guided only by his natural abilities and without the benefit of instruction (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903). This applies to medicine, physiology, pathology, invention of effective treatment and cure by drugs or preparations. He concluded that all prestigious and reputable fields of science rely on sufficient experimentation and strategic observation (S. Al-Hassani and S. Zaimeche 2003; J. W. Draper 1875; N. Daniel 1993; P. Coles 1968; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903).

Kitab al-Akhlaq wa al-Siyar: In this book, Ibn Hazm urged people to compare themselves to those lower to them when it comes to wealth, status and health. In terms of faith, sciences, and virtue, people should compare themselves with those higher than them. He mentioned that sciences are like powerful drugs which suits the strong and exhausts the weak. He further mentioned that complex sciences enriches a vigorous mind and keep it off evil but exhausts the mediocre mind. Consequently, science is a single entity devoid of neither any moral dimension nor the most important moral outlet in life (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903).

He asserted the real meaning of life and how all worldly things are of lesser value in comparison to the spiritual and moral. He explained that most people rush into misery, worry, anxiety and amassing terrible sins that will earn them hell fire but on the other hand, the people with purer intentions will obtain great rest for their souls. After declaring his moral stands, he finds adequate room for science by looking at it in different contexts and situations. Firstly, he gave it its real due by stating should the merit of science being fear of the ignorant, and love and honor for the scholars that alone should encourage striving for it. This is because of the reward in this world and the hereafter (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903, D. A. King 1993).

Al-Fisal fi al-Milal Wa al-Nihal: Ibn Hazm was the first religious historian ever. This book is the first of its genre and surprisingly, it was written in the 11th century when no scholastic work like it existed in Christian Europe. He proceeds like a scholar and a theologian who is acquainted through his own study and experience with the religions of his time and he analyses them in detail, quoting their texts. A very interesting notion on the nature of motion of bodies is in this book. He explained that there are mobile objects and stationary objects yet there is neither motion nor stationariness (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Mercier, P. Raymond 1992; Mohr, P.J.; Taylor, B.N. 2000).

He refuted astrologers who claimed that stars and planets had souls and minds and can influence people. He maintained that the stars are celestial bodies with no mind or soul without any power to know the future or affect people. There effect on people is through their physical characteristics just like the effect of the sun's heat and rays on the planets and the effect of the moon on the tides of seas (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956, Mohr, P.J.; Taylor, B.N. 2000).

He explained that Saturn's orbit takes 33 years. Today's astronomy recognizes Saturn's orbit around the Sun taking 29 years. He argued against those who believe that the Sun sets in one of the seas on Earth. He questions the possibility of a larger Sun setting in a smaller Earth. He discovered that the Earth is spherical

despite what was popularly believed. He proved this by showing that the Sun is always vertical to a particular spot on Earth. Conclusively, he challenged all theories on the age of the Earth by showing that we do not have definite knowledge of the age of the Earth because it could be many multiples of the ages suggested by others (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Mohr, P.J.; Taylor, B.N. 2000; Sarma, K.V. 2008).

Kitab al-Muhalla bi al-Athar: This book is a commentary of his own book titled al-Mujalla ("The Brilliant Treatise") and it is considered a masterpiece of fiqh literature. This book is a wealth of scholarship in which Ibn Hazm discusses each question separately. On each question, he cited the views of earlier reputed scholars and not restricting himself to the views of the four schools of Fiqh. He also cited the rulings of scholars like al-Hassan al-Basri (d. 110), al-Laith ibn Saad (d. 175), Ata' (d. 114), Sufyan al-Thawri (d. 161), al-Awza'ie (d. 157) and many others. He also quoted the evidence they cite in support of their views. He then discussed why he considered their views incorrect and produced the evidence in support of his own view (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903; Glick, *et al.*, 2005).

Consequently, this made his book a highly scholarly discussion. His book is just like an encyclopedia of Islamic Fiqh, It has successfully preserved many of the views of early scholars whose work was either not documented or lost. Undoubtedly, this book shows that he is an honest proponent of what he considers to be the truth. Consequently, any scholar who wants to exercise ijthad in order to arrive at rulings for questions encountered in our contemporary society will find this book indispensable (S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Glick, *et al.*, 2005).

Tawq al-Hamamah: Ibn Hazm's psychology is displayed in this book, he gave a detailed description of love as an attribute and accident. Furthermore, he described the different categories of love, namely, falling in love while asleep, falling in love through a description, falling in love at first sight and other forms of love manifestation (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Glick, *et al.*, 2005). The objective of this book is to analyze and scrutinize scenarios from the lives of people. He knew or was told about regardless of the fact of being righteous or sinful, he reconciled his stance towards this subject by devoting the last two chapters on purely orthodox and morally accepted chapters: "The Vileness of Sinning" and "The Virtue of Continence" (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Ibn Hazm 1899, Ibn Hazm 1903; Glick, *et al.*, 2005).

A. J. Arberry who is a doctor of literature translated his works, he is interested in works of literature written in Arabic language. Due to translation, there were slight mistakes; this is evident when the poems were translated liberally for the sake of the rhyme in the English language. This can change, alter the emotion and originality of the poem because one cannot make a poem rhyme in two languages. If it rhymes in Arabic, it won't rhyme in English because these are two distinct languages. As a result of this, much of the poetry in this book lost their originality with respect to language, syntax and diction. Moreover, this work was translated in the 1940's which are approximately some 60 years ago. Therefore, the period of time might also account for the odd English grammar and structures (A. J. Arberry, L. Oriental, 1997; S. Al-Hassani and S. Zaimeche 2003; R. Arnaldez 1956; Glick, *et al.*, 2005; B. Hofmann-Wellenhof *et al.*, 2005; Thomas H. *et al.*).

Conclusion and Recommendations:

Much of Ibn Hazm's work is still in Arabic. Although there are numerous Spanish and French translations of some of his books, there are very few in English. This project explained his contributions and thought on science, its virtues, territoriality, methods of its instruction and acquisition. Ibn Hazm's status is comparable to the French philosopher-rationalist, Descartes. Perhaps more appropriately, comparisons should have been drawn between Ibn Hazm and the other French philosopher-scientist: Pascal: the cohabitation, or the working together of science and high, God-inspired morality.

Ibn Hazm's thoughts and philosophy on science have also another dimension. He immensely helped in classifying sciences in order to foster their understanding and promotion. He drew the boundaries and rules within science as a whole. This classification has gradually perfected our modern learning system. Any scholar who is often at odds with themselves and the hows and whys of their science have to return to Ibn Hazm. He has made substantial contribution to the clarification of scientific thought.

It is strongly recommended that his work should be translated to English language and other universally used language so as to stir interest, awareness, research and usage of his works in order to appreciate important philosophical, scientific and technological advances made in the medieval period.

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