

Reading the Future and Freeing the Will: Astrology of the Arabic World and Albertus Magnus

by Scott Hendrix

Albertus Magnus, or “Albert the Great,” wrote the work now known as the *Speculum astronomiae* around the year 1260.¹ In part, the *Speculum* acted as an introduction to the science of astrology and the sources necessary for the serious astrologer. Yet more importantly, it provided a thorough and knowledgeable defense of the science of astrology in the face of religiously motivated opposition. In order to accomplish these goals, Albert drew on a large number of astrological and astronomical texts written by authors from various backgrounds, but his most important sources were those of Arabic writers in Latin translation.² This study analyzes how these works influenced Albert’s understanding of astrology, as well as the ways in which he made conscious or even unconscious use of this Arabic scholarship.

The integration of the scientific principles of astrology and its sister science, astronomy, into the Western tradition involved far more than a transmission of Greek scholars, such as Ptolemy, through Arabic intermediaries. Arabic scholars creatively blended many traditions to create a hybridized Arabic science. The evidence demonstrates that the transmission of scientific ideas to the Latin Christian world from the Arabic world involved extensive Arabic contributions, not only in technical aspects, but also in how those sciences were understood and accepted. I argue that Arabic philosophical justifications for the acceptability of the predictive sciences, within a religious context which held free will to be axiomatic, provided Albert with a ready-made response to religious critics of judicial astrology, that is, making judgments about future events or discovering the most propitious times to perform certain actions.³

While it is widely known that Arabic science influenced the West, it is less well known that Arabic justifications for these sciences could also impact the usage and development of such sciences by Christian scholars.⁴ Yet the Christian and Muslim worldviews of the period were not so very different: the two groups shared a deity as well as certain religious texts and Aristotelian modes of interpreting their religious beliefs.⁵ Contemporaries, however, often focused on the differences; even some modern scholars have asserted that Latin Christendom was too hostile toward Islam to be influenced to any significant degree by these competing religious ideas.⁶ In fact, medieval Christian attitudes toward Islamic religious thought are often portrayed as filled with barely restrained outrage.⁷ Within the context of such an interpretation, it would seem that Christian scholars in the medieval period might borrow Arabic science, but would not be interested in the philosophical justifications that were used to integrate that science into a competing religious tradition.

Fortunately, current research is beginning to undermine the simplistic interpretation stressing vitriolic Christian attitudes toward Islam. The work of Thomas Burman indicates that some Christian intellectuals did in fact study the Qu’ran with a measure of respect.⁸ For example, Peter the Venerable, the twelfth-century abbot of Cluny, did not content himself with a regurgitation of standard Christian attacks on Islam.⁹ Instead, his refutations of Christian misperceptions of Muslim attitudes toward such central subjects as the Christian Trinity and the Prophet Muhammad indicate a close study of the Qu’ran and a desire for accuracy.¹⁰ Christian polemic was not overly concerned with accuracy; such a close scrutiny of the Qu’ran seems indicative of

real interest and respect. Furthermore, Thomas Burman has shown that the translation of the Qu'ran that Peter worked from demonstrates that Robert of Ketton made frequent appeal to Muslim commentaries in order to insure the highest degree of clarity possible.¹¹ If such men as Peter the Venerable and Robert of Ketton could treat the Qu'ran with respect in applying themselves to a careful study of the text and its meanings, it stands to reason that some scholars of the Christian West could approach preexisting Islamic justifications for science created by their Muslim counterparts with equal respect. In some ways a borrowing of ideas seems natural, since the two religions do have common ground.¹²

Albert the Great's *Speculum astronomiae* provides extensive evidence of cross-cultural borrowing of scientific and philosophical ideas in its presentation of astronomy and astrology.¹³ But in order to understand the influence of scholars of the Arabic world on Albert's work, it is first necessary to understand how and why astrology could be considered a hard science in the thirteenth century. Modern scholars have so discredited astrology that it now merits little attention beyond the realms of the history of science.¹⁴ For a large number of medieval intellectuals, from Albert to Peter d'Ailly, there was no question of judicial astrology's efficacy. Numerous empirical studies¹⁵ and sophisticated mathematical theories promoted confidence in the discipline.¹⁶ Judicial astrology held an important place in the structural framework of the medieval intellectual tradition that informed politics, military science, philosophy, and cultural and social mores, to name only a few areas of its recognized influences.¹⁷ From advice given to kings to the guidance that astrologers offered to merchants, it is difficult to overestimate astrology's wide-ranging impact.¹⁸ This impact was long lasting as well, remaining alive in the minds of scholars as late as Johannes Kepler.¹⁹ None of this would have been possible without Arabic contributions; thus it is important that we understand how astrology was practiced as a science in the Arabic world and how Europe received it. As a result we see that the West inherited both a system of thought as well as an accompanying body of philosophical justifications that had been elaborated by scholars working in a Muslim milieu.

Astrology elicited suspicion in the Arab world from the earliest period of Islam. Astrologers were associated with the ancient *kahhan* (diviner priests), whom Mohammad, according to tradition, had denounced.²⁰ There were no Arabic translations of scientific astrological treatises until the ninth century, which both limited the practice of astrology and fostered suspicion of predictive sciences. The first translation of an astronomical text did not occur until 803, when either Ibrahim al-Fazari or his son Muhammad translated the Indian *Sindhind*, a work based on Alexandrian Greek learning. The *Sindhind* was a treatise on astronomy and mathematics not designed for practical application, and as such served as an immediate catalyst for heightened interest in the celestial sciences. Shortly thereafter, an unknown scholar translated Ptolemy's *Almagest* to fill the gaps left by the *Sindhind*. The *Almagest*, along with Euclid's *Elements*, provided the basis for the practice of applied astronomy, or what would come to be known as astrology. Such an interest in the applied science of judicial astrology, rather than mathematical astronomy, was emblematic of the Arabic approach to Greek learning, which was directed not at abstract subjects such as poetry or drama but rather at the practical arts, such as astronomy and medicine.

It did not take long, however, for Islamic intellectuals to attack the practice of astrology. Early assaults on its accuracy, such as the poem written in 838 by Abu Tammam al-Habib ibn Aws, had little impact.²¹ Much more serious, however, were the charges leveled against the astrologers for their supposed opposition to the Islamic faith. This is typified by the anonymous accusation

directed at Abu Ma' shar that he had "studied astrology until he became an atheist."²² A charge of atheism was dangerous indeed, for it threatened to implicate those students of the so-called foreign sciences, which included medicine, the natural sciences, mathematics, geography, alchemy, and mechanics.²³

Such attacks on astrology were problematic for practitioners, but this did not stop astrologers from plying their craft in almost every domain of public life.²⁴ Thus even before the science of astrology had been fully developed, almost every court had an astrologer in residence, and Arabic elites made ready use of astrologers as advisors. Despite the religious opposition it encountered, a system of astrology based on Greek learning was quite attractive to the sophisticated intellectuals of the eighth- and ninth-century Arabic world and those who employed them, because it promised to explain the universe in terms of a well-defined structure of interrelated bodies interacting in a predictable and logical fashion.²⁵ The founding of Baghdad in 762 is the most notable example of an elite appealing to an astrologer. The Caliph al-Mansur had the first stone of the city laid in accordance with the astrological casting of an election, meant to determine the most propitious time for an action, by the Persian Jew Masha'allah (d. 815).²⁶

Given such an important role in both courtly life and society at large, astrologers thrived in spite of continuing opposition. They could not ignore accusations, however, that their science opposed Islamic faith. The primary motivation for these charges was the concern that a science promising to predict the future removed any possibility for the free exercise of human will. Since free will was just as axiomatic for the dominant expressions of the Islamic faith as for Christianity, this was a most serious accusation.²⁷

The Muslim astrologer whose works most influenced the West addressed this charge, and it was his justification that Albert would promote in his own defense of astrology. Abu Ma' shar Ja'far bin Muhammad al-Balkhi, known to the West as Albumasar, was born in Khurasan in 787 and died in Iraq in 886.²⁸ Abu Ma' shar argued that astrology was superior to all other forms of natural philosophy. He believed it provided the basis for the other sciences, while such fields as medicine merely expanded its principles in a narrowly utilitarian fashion.²⁹ To promote astrology, Abu Ma' shar wrote compendiums of astrological axioms intended as practical manuals.³⁰ However, he viewed himself as much more than simply a compiler of others' ideas. He believed that all thought was derived from a single antediluvian revelation; thus, by piecing together elements from different sources, a scholar could arrive at a single "Truth."³¹ Ultimately his methodology led him to an important original contribution of how to reconcile astrology with Islamic religious principles. Abu Ma' shar introduced the concept of the "rational soul," or man's free will coupled with the cognitive abilities that differentiated him from animals, which was free from the influence of the stars.³² This soul, along with all else that a man possessed, came from God.³³ In a blending of Aristotelian and Neoplatonic ideas, Abu Ma' shar envisioned the soul, divine gift to man, descending from the heavens through three spheres: the divine (the sphere of light), the ethereal (the eight celestial spheres), and the hylic (the sublunar core, including the Earth).³⁴

Abu Ma' shar associated God with the Aristotelian Prime Mover, who was the efficient cause of all earthly actions, following Aristotle's delineation of causes.³⁵ Thus God creates man, provides him with a soul, and influences that "rational soul" toward actions; but since man has free will, this is an influence, powerful though it may be, that may be overcome through exercise of the will.³⁶ These influences did not provide the only motivation for the soul. Since it had descended

from the divine to the hylic realm, it desired to return, signifying a desire within the human soul to understand the divinity of God and act in accordance with His will.³⁷ In order to achieve connection with God in the mystical sense, and to comprehend His divine plan for the universe so that man may order his life by it, it is necessary to understand the celestial intermediaries. Astrology thus provided the closest possible approximation to an understanding of His will.

Albert recognized that Abu Ma' shar's justification for astrology could be instrumental to a defense of the science within a Christian context. The theory that the stars only influenced human actions, rather than governed them absolutely, effectively negated, at least for Albert, the argument used by those who opposed astrology based on its presumed conflict with Christian beliefs in the freedom of the human will. He states:

concerning something for which it is contingent that it will be...before it is, it is always possible for it both to be and not to be...it does not follow...[that] before it is, it cannot not be...for every contingent being...it can always be and not be...it is not the same thing to be necessarily when it is as to be simply by necessity...and yet it will be because it is not necessary that potentiality [must] be reduced to actuality...regarding that about which it is signified...it can always be before that [time], and [up until that time when] it finally reverts back to the nature of the impossible...this is the opinion of Albumasar [Abu Ma' shar], from which the famous Aristotle seems to depart to some extent.³⁸

Put more clearly, Albert claims that nothing is predetermined in either a positive or negative fashion. For Albert, there was a distinct difference between something that comes to be "necessarily," as preordained, and something that comes to be after a foretelling of that event. Not until the event comes to pass does it "revert back to the nature of the impossible." At that point, and only at that point, the event in question attains actuality; but until the event occurs, it is simply a contingent possibility.

Albert openly credits Abu Ma' shar for the formulation of a theory designed to make the science of astrology acceptable to Islamic authorities.³⁹ Interestingly, Albert uses this philosophical argument in the same manner within a Christian context without any suggestion that this usage might be problematic. It is also important to emphasize that Albert considered Abu Ma' shar more authoritative than Aristotle in the field of astrology.⁴⁰ This was a reasonable attitude, for if Abu Ma' shar developed little that might be considered wholly original, his application of Greek models to astrological theory formed the basis for medieval astrological thought, both eastern and western.⁴¹ Furthermore, he extended the arguments of Aristotle by insisting that if celestial influences led to the generation and eventual death and corruption of terrestrial creatures, then it is only logical to assume that a study of the heavens could allow one to determine the course of future events.⁴²

Albert further developed his own understanding of astrological theory to explain that, far from compromising Christian orthodoxy by proposing that celestial influence negated mankind's free will, understanding heaven's effects upon the human body could perfect Christian belief.⁴³ He proposed that astrology, as "the link [between] natural philosophy and metaphysics,"⁴⁴ could allow one to live a life more fully Christian. Only through the study of the heavens could one come to know God, as well as the effects of the stars upon our bodies, for

if God...has ordered this world...as to operate in created things...through stars...as if through instruments...what could be more desirable to the thinking man than to

have a middle science [between natural philosophy and metaphysics] that may teach us how this and that change in the mundane world is effected by the changes in the heavenly bodies.⁴⁵

Therefore, if the “thinking man” wished to experience the “creator of creatures,”⁴⁶ he should investigate the natural manifestations of God’s will upon the Earth through His agents, the stars. In a less mystical, less Neoplatonic sense, this is very similar to Abu Ma’ shar’s argument that astrology is congruent with, rather than opposed to, religious orthodoxy. Abu Ma’ shar argued that through understanding the celestial intermediaries, one might understand God’s divine plan and thus connect with God in a mystical sense.⁴⁷ Nevertheless, he stopped short of arguing that the study of astrology could actually make one a better Muslim.

Thus the possibility that astrology could be harmonious with a monotheistic faith that held free will as a crucial tenet had been suggested before the science was introduced to the West in the twelfth century.⁴⁸ However, the theory that the stars merely influenced human action was far from satisfying to all Islamic religious leaders, just as it would fail to satisfy all members of the

IN ASTROLOGOS.



Fig. 1. Jörg Breu, *In Astrologos*. Woodcut from Andrea Alciato, *Book of Emblems* (1531), p. C7r. (Reproduced from Wikimedia Commons.)

Christian church. The continuing controversy over this theoretical justification led to an interesting development in the East that had important implications for astrology as it was transmitted to Europe. It would serve, to a great degree, to split the sciences of astrology and astronomy.

Astrology and astronomy formed interconnected components of the same science from antiquity.⁴⁹ Opposition to the science, as detailed above, led to a very creative institutional response. The position of *muwaqqit*, or timekeeper, was created at mosques in the early eleventh century.⁵⁰ This was a lucrative post that required a scholar skilled in the astronomical arts to maintain the calendar and perform astronomical observations for the mosque. However, the position was completely closed to anyone who had any association with predictive astrology.

This prohibition meant that, with the exception of the few astrologers employed by secular authorities, practitioners of the science were largely relegated to the streets.⁵¹ Over time this led to the division of the science that had once been known simply as *‘ilm al-nujum*, or the science of the stars, into its component parts of *‘ilm ‘ahkam al-nujum* (the science of the decrees of the stars, or astrology) and *‘ilm al-hay’ a* (the science of the [heavenly] configurations, astronomy).⁵² In this way, tensions within the Arabic world split the interconnected astronomical science of Ptolemy, passing on the individual components to Latin scholars such as Albert. Therefore, although Albert recognized that the “two great wisdoms” were each “called by the name of astronomy,” he clearly differentiated between the “science of the configuration of the first heaven” (astronomy) and the “science of the judgments of the stars,” which is a literal translation of the Arabic *‘ilm ‘ahkam al-nujum*, astrology.⁵³

The *Speculum* begins with a discussion of what some medieval scholars would refer to as “theoretical” astronomy, meaning that part of the science that modern astronomers would still recognize.⁵⁴ In the first two chapters, Albert analyzes the functions of the medieval astronomer and the sources that such an astronomer could utilize to gain a greater understanding of astronomical movements and events. Within this section there are certain functions that a modern astronomer might disavow, such as the measurement of epicycles,⁵⁵ but one would have to agree with Albert that there is nothing within this discipline that should excite the opposition of theologians.⁵⁶

Albert clearly conceived of the division of astrology and astronomy as being something intrinsic to the study of the heavens. He states that “there are two great wisdoms and each is called by the name of astronomy.”⁵⁷ Because the singular passive verb *censetur* takes the ablative of name (*nomine*) in this sentence, there is no doubt from a linguistic standpoint that Albert conceived of the two *sapientiae* as each (*utraque*) representing a distinct subject. This is certainly borne out in Albert’s treatment of these “two great wisdoms” in the rest of the text. He devotes only two chapters to the first “wisdom,” which we may call mathematical astronomy; it only treats celestial motion, and derives its importance from its status as a necessary subdiscipline of the study of astrology. Albert reserves the other fifteen chapters for an analysis of judicial astrology in all its variety. Tellingly, Albert refers to each component of astrology as a “part” of the larger whole, whereas his language leaves no doubt about the independent nature of astronomy and astrology. The two *scientiae* are definitely linked, but each can stand alone. It is the latter that is the most important, allowing humans to “attain” as close an understanding as possible of God’s sublime ordering of the universe “through the mute and deaf stars as if they were his instruments.”⁵⁸ In this way, we may see that a division that arose out of the religious conditions of the Arab world became embedded in Albert’s understanding of the science, or rather sciences, since he considered them separate from one another.

So far I have attempted to demonstrate that Albert and Abu Ma’ shar agreed as to the importance of judicial astrology. I have also sought to show that Abu Ma’ shar provided Albert with an astrological model. So what was the system that Abu Ma’ shar shared with Albert the Great? Borrowing elements from Greek and Indian natural philosophy, articulated by scholars writing in Arabic, and blended with original elements, the astrological system that Abu Ma’ shar passed on to Albert the Great was thoroughly hybridized. It will be useful to explore that system before demonstrating the way in which Albert appropriated Arabic philosophical justifications for the practice of astrology.⁵⁹ While Albert himself was no astrologer, he referred to specific astronomical and astrological points in order to illustrate his positions.⁶⁰ What is more, without the astrological system developed by Arabic scholars and transmitted to the West by translators such as Adelard of Bath and Hermann of Carinthia,⁶¹ Albert’s defense of astrology would have been moot: there would have been no practice of astrology to defend.

Astrology was built on the premise that the supralunary world of celestial bodies in constant motion influenced terrestrial events through the transmission of rays of light imparted with divine power.⁶² The human body was presumed to be a microcosmic representation of the larger macrocosm of the universe. Celestial motion, combined with the qualities of individual celestial objects, affected the four humors of the human body by imparting these light rays.⁶³ In this way, celestial influence was held to be one of the most important determining factors that doctors considered when attempting to deal with human ailment.⁶⁴

Abu Ma' shar derived the basis for this system from Ptolemy's *Almagest*, a second-century Alexandrian fusion of Greek, Babylonian, and Egyptian ideas⁶⁵ that established the Earth as the center of the universe. Seven planets—the sun, moon, Saturn, Jupiter, Mars, Venus, and Mercury—revolved around it in complex relationships with the twelve star groupings known as the zodiac.⁶⁶ The zodiac was conceived as an imaginary circular band in which each sign occupies thirty degrees.⁶⁷ Later scholars elaborated this basic model to include Egyptian decans (stars or groups of stars that intersected the ecliptic) or the apparent path that the Sun takes around the Earth as measured against the backdrop of the stars.⁶⁸ Each decan intersects the ecliptic at ten-degree intervals for a total of thirty-six decans; each served as the primary influence, or ruler, over a specific ten-day period.⁶⁹ The addition of the paranatellonta, or stars that rise and set to the north or south of degrees on the ecliptic, further elaborated the astrological model.⁷⁰ Although it seems to detract from the coherence of a system based upon the 360 degrees of the ecliptic, these paranatellonta appear to have been divided into 365 sections, apparently so that the astrologer could assign one to each day of the year.⁷¹

Finally, Ptolemy divided the sky into twelve celestial houses by projecting three overlapping areas onto the heavens. Four pivotal points intersected the sky: the ascending point of the ecliptic on the Eastern horizon, the descending point of the ecliptic on the lower meridian, the intersection of the ecliptic with the upper meridian, and the descending point of the ecliptic with the upper meridian.⁷² The planets moved from one house to another every two hours, and each combination of planet and house could impart various characteristics to a newborn. Thus, casting nativities, or horoscopes indicating an individual's future prospects, relied heavily upon the precise time of birth.⁷³

Astrologers supplemented these mechanistic principles by ascribing characteristics to each zodiacal sign and planetary body based upon Egyptian and Roman mythology. The application of these characteristics allowed the astrologer to make judgments about an individual's character based on nativity casting. For instance, a native (the individual whose destiny was being foretold)⁷⁴ born with Saturn as the lord of the ascendant might possess any number of negative characteristics, from timidity to self-absorption.⁷⁵ If born under the sign of Aries he might be talkative, kingly, brave, lustful, or any combination thereof.⁷⁶ With each stellar body and zodiacal sign representing a wide array of often conflicting characteristics, astrologers often created vague and ambiguous nativities.⁷⁷

Other types of predictive judgments failed to achieve higher levels of precision. Every astrological indicator presented multiple possibilities; furthermore, the system involved a far more complex interpretation of the interrelationships of planets, houses, zodiacal systems, and other stellar signifiers than is possible to discuss here. How any given astrologer interpreted his results was ultimately a matter of personal judgment. It is likely, however, that he would have argued that the system was not ambiguous but rather so complex that absolute precision in measurements and calculations was of paramount importance.⁷⁸ Yet the ambiguities, or complexities if you will, served to mask the underlying mistaken assumptions by making any failed horoscope seem less the result of a nonfunctioning system than a simple failure in interpretation.⁷⁹ Nonetheless, as a theoretical model, astrology was impressive enough to convince Albert the Great, who was hailed by such contemporaries as Ulrich Engelbert of Strassburg as “a man in every science so divine that he may well be called the wonder and miracle of our time,”⁸⁰ of its efficacy.

The astrology that so interested Albert was an enticingly elaborate system, but it had been brought to this point not by the Greeks but by scholars writing in Arabic, such as Abu Ma' shar. It might seem odd to emphasize this Arabic element, given the important place that Ptolemy's works held in the lexicon of astrology. However, the science that Ptolemy contributed to is what medieval intellectuals would recognize as astronomy proper, rather than its applied aspect that came to be known as "the science of the judgments of the stars," or astrology.⁸¹ Ptolemy did refer to Aristotelian concepts that were important to predictive astrology, such as a hierarchy of celestial influences that began with the Prime Mover and affected the generation and corruption of terrestrial creatures, but these ideas were not well developed in his works.⁸² It was then left to Arabic or Arabic-influenced scholars of the ninth and tenth century to provide a thorough integration of these concepts with the mathematical and theoretical models provided by the Greeks.

Three Arabic texts representative of the astrological system developed in the Arabic world are al-Bitruji's *De motibus caelorum*, which teaches us about astronomy; Masha'allah's *Tres libri*, a text demonstrating how to apply astronomical data in order to make predictions; and Thabit's *De imaginibus*, a work articulating methods one may use to harness and direct celestial influence. The different content of these texts reveals much about astrological practice and theory in the Arabic world, which influenced Albert as well as many other European scholars. The first two texts are relatively unproblematic for someone who has already accepted the premises of astrology. However, Albert's inclusion of Thabit's work as an important source is at first surprising for its strongly magical nature, at least until one understands the importance of a magical work of this sort within the context of Albert's Christian beliefs. I will examine this in its place.

As mentioned previously, the science of astronomy became separated into its component parts of theoretical astronomy and astrology.⁸³ Although in the East this was not fully completed within the academic curriculum until the thirteenth century, the process was well under way by the tenth century.⁸⁴ The division is quite apparent in al-Bitruji's text, written in 1185 in Spain, for there is no mention of anything within it that could be considered astrological.⁸⁵ What it does provide is an astronomical system through which one may understand and describe a wide variety of celestial motions. Albert provided a specific description of the province of astronomy within the second chapter of the *Speculum*,⁸⁶ in which he states that the astronomer should be able to measure the size of stellar objects and their distances from the Earth,⁸⁷ the configuration of the heavens and the motions of the second heaven, which contains the "fixed and wandering stars," and understand the science of heavenly motions and planetary eclipses.⁸⁸

Within these areas that Albert considered the proper province of astronomy, al-Bitruji's work discussed almost all of the relevant criteria. For example, he modified the Ptolemaic system of motion by defining and explaining the motion of the so-called "fixed" stars, which in fact changed position gradually, at the rate of one degree every one hundred years.⁸⁹ Furthermore, he postulated the existence of a set of poles for each planet, thus taking into account individual planetary rotations, rather than the single set of poles for the rotation of the universe around the Earth that Ptolemy relied upon.⁹⁰

Al-Bitruji's text is an excellent example of Arabic astronomical theory in that it supplies sophisticated mathematical models useful for understanding the movements of celestial bodies. The astronomer's computational models, when applied to data obtained through observation, would allow the astrologer to gather and process the hard data he needed to practice his science.

Those who followed Abu Ma' shar's view of astrology would have seen astronomy in this way, because astrology, in dealing with substantive causes and effects, was far more important than the study of mathematical abstractions.⁹¹ Thus, European scholars apparently found al-Bitruji's work to be worthy of dissemination because it both provided a handy guide to the technicalities that an astrologer must master, and in many cases allowed for more accurate predictions of celestial motion than did Ptolemy's *Almagest*.⁹²

Both Ptolemy and al-Bitruji (or alternatively, Ptolemy and thus al-Bitruji) worked from the Aristotelian model of planetary motion in which all motive force in the universe is imparted by the Prime Mover from the highest, starless sphere, the Primum Mobile, that encompasses the entire universe.⁹³ This motive force travels in a great chain from the highest sphere through the seven below it, with each individual motion set into action through a single mover acting upon a single movement, or moved body.⁹⁴ In other words, following the Aristotelian doctrine that every motion must be imparted by a motive force, the Prime Mover imparts motion to the Sphere of Saturn, which in turn imparts motion to the Sphere of Jupiter and so forth, all the way down to the terrestrial realm, where earthly creatures receive the influence of the Prime Mover, altered by passage through each of the planetary spheres.⁹⁵

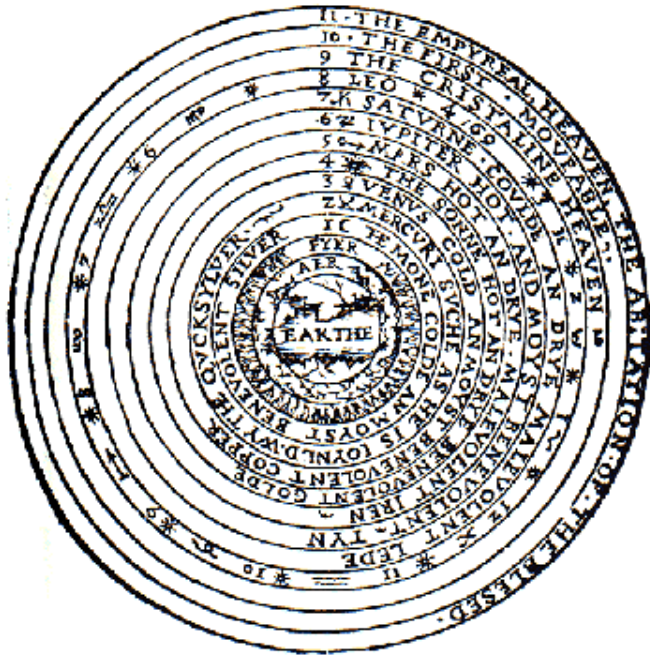


Fig. 2. *The Ptolemaic Universe*.
Woodcut from Andrew Borde, *The First Book of the Introduction of Knowledge* 1542 (1547).
(Reproduced from Anniina Jokinen, "Medieval Cosmology," *Luminarium*.)

The second and larger section of al-Bitruji's work, filling eleven chapters out of twenty, goes beyond the theories and descriptions of celestial motion to undertake a complex analysis of the mathematical models that enable the astronomer to understand it. The author explains how to use geometric and

trigonometric calculations to articulate the movements of each of the seven planets.⁹⁶ Important modifications of the Ptolemaic system include the addition of planetary rotation and the replacement of epicycles (in which planets orbit an imagined central point) with the theory of trepidation (in which they orbit the Earth at variable rates of speed).⁹⁷ This resulted in apparent retrograde motion of certain planets, such as Mercury, in relation to the other planets and the "fixed" stars.

In order to understand how to interpret the astronomical data gathered through al-Bitruji's teachings, the astrologer needed the direction provided by works such as Masha'allah's *Tres libri*. This text contains three short pieces that are wholly astrological, with no astronomical techniques mentioned and not a mathematical formula to be found. For those who viewed astrology as applied astronomy, as Albert seems to have done, the *Tres libri* would have been the practical complement to the abstractly mathematical work of authors such as al-Bitruji.

Masha‘allah was a Persian Jew from Basra who worked as an astrologer in Baghdad from about 762 until 815.⁹⁸ He was the first scholar to introduce elements of Aristotelian physics into Arabic science, probably through the use of Harranian translations of the Philosopher’s works. He blended Aristotelian physics and cosmography with Pahlavi and Syriac astrological doctrines. In his astrological histories, a science perfected in Sasanid Iran, he also interjected elements of Zoroastrian millennialism, or the belief in dramatic epochal changes occurring to mark the end of an age.⁹⁹

The *Tres libri*, when taken together, provide a thorough guide for the production of astrological prognostications based on “hard” astronomical data. These instructions allowed an astrologer to apply himself to a wide variety of the forms of judicial astrology. For example, Masha‘allah explains how to make a determination of the “revolutions of the years of the world,” or predict the events for a given year.¹⁰⁰ He states that such predictions will take the form of generalized judgments rather than providing a day-by-day description of future events. Nevertheless, it was easy to see the utility of even such limited knowledge of the future.

In order to obtain the judgment in question, it was necessary to consider a number of variables. According to the first chapter of *De revolutione*, the opening work in Masha‘allah’s *Tres libri*, one must first find the “lord of the ascendant,” or the planet nearest to the first degree of the zodiac to rise on the first day of the new year.¹⁰¹ When the sun rises, the astrologer must carefully determine its position relative to this lord. If the relative positions of the sun and the lord of the ascendant are “free from evil,” then one may determine that the year will be one of good weather and victory in battle.¹⁰² When the astrologer takes into account the relative positions of the moon or other planets, then the generalized nature of the coming year may be revealed. As with all other aspects of astrology, however, this relatively straightforward system is modified by a host of complicating factors. The first of these is the determination of the “triplicity” within which the ascendant belongs.¹⁰³ All zodiacal signs belong to one of four triplicities, which are groupings of three signs of the zodiac according to their supposed natures.¹⁰⁴ Furthermore, each triplicity has an assigned lord by day, another by night, and one which shares the lordship during both night and day.¹⁰⁵ Only by measuring the relationship of the lord of the ascendant within the triplicity to the lords of that triplicity could an astrologer arrive at a final judgment as to the disposition of that year.

For the purpose of this study, the intriguing point about this system is not so much its complexity but rather the way in which Masha‘allah blended differing cultural traditions to create a useful, and thoroughly hybridized, model. Although it is difficult to determine the provenance of each aspect of this theory, it is clear that it contains elements of Alexandrian Greek and Sasanian traditions. The Sasanians placed great emphasis on the triplicities and their lords in their political and historical astrology, while Masha‘allah’s basic model, featuring the transmission of influences through the spheres to the sublunar realm, is familiar from Ptolemy’s *Almagest*.¹⁰⁶

De receptione, the prologue of the third of Masha‘allah’s *Tres libri*, elucidates an important point in the author’s theory: he states that the entire system functions “by the will of God” and that knowledge about any given event may be “prohibited by the will of God.”¹⁰⁷ Masha‘allah’s assertion that celestial influence and astrological forecasting function according to divine will is congruent with his concern as a Jew to recognize that ultimately all power rests with God. If the astrologer was successful, then it was “by the will of God.”¹⁰⁸ Without His assent, there could be no successful divination. Masha‘allah appears to have been the first to associate successful

astrological divination with God's will, an idea that Albert would later adopt,¹⁰⁹ which neatly refuted the claims of those who would associate astrology with demonology.

It is understandable that monotheistic Jews and Muslims produced works structured around the idea of God's omnipotence, which would be quite attractive to a Christian author such as Albert. However, not all scholars writing in Arabic were monotheists. Thabit ibn Qurra, the author of *De imaginibus*, was a committed Sabien, a pagan religion that maintained a system of worship centered on the seven planets whose seven ruling angels acted as mediators to earthly concerns.¹¹⁰ According to early tradition, Thabit worked as a moneychanger in the market of Harran while writing philosophy in his spare time.¹¹¹ An intensive education nourished his interest: we know he was fluent in Greek, Syriac, and Arabic. The High Priest of Harran excommunicated him in 872, although there are no clues as to what transgression Thabit might have committed among the Sabiens.¹¹² Thereafter, Thabit traveled to Baghdad where he lived until his death in 901. During the course of his life he wrote 150 books in Arabic on logic, mathematics, astronomy, and medicine, as well as another fifteen texts in Syriac.¹¹³

Thabit's *De imaginibus* is on the "more valuable astronomy...the science of images."¹¹⁴ The images in question are charms made from "tin, lead, silver, or gold" with the name of the ascendant and its corresponding lord, as well as the lord "for the hour and the day," carved upon them.¹¹⁵ The inscription is placed beside the sign of the planet from which one hopes to receive a beneficial influence. With the properly constructed charm one might be able, for example, to rid an area of vermin, ward off the effects of a malefic planet, affect the judgment of kings, or even bring ruin to a city.¹¹⁶

Albert's inclusion of a section on images in his own work, based on Thabit's text, is problematic.¹¹⁷ The difficulty with image magic arises from its attractiveness: rather than simply studying the heavens for predictive signs of the future, the use of astrological images represented a means by which one might harness the power of the heavens to alter reality. This was the art of the magician, and the use of images in such a manner often raised considerable ire among Church officials.¹¹⁸ Even Albert himself commented in his *Sententiae* that the use of images "inclines [men] to idolatry by imputing divinity to the stars and...is employed for idle or evil ends."¹¹⁹

Although Albert does provide a disclaimer in the *Speculum* about refraining from using images,¹²⁰ a single sentence at the end of two chapters discussing the application and benefits of images suggests that he did not find concerns about their usage credible. He did not intend to warn people away from the use of images; rather, he argued that images function "from the celestial virtue by the command of God" and only present a problem to the practitioner "if the conditions [upon which the use of the image is based] are secretly necromantic."¹²¹ Therefore, in his *Speculum* he is not warning the individual away from the use of images, but rather from the misuse of such images. Maintaining the permissibility of image magic strengthened Albert's overall argument for the value of astrology as a science that did not conflict with free will. Albert wrote the *Speculum* during a time when many viewed astrology with great suspicion, due to a fear that a predictive science might call free will into question. If one could counteract the influences of the stars, or change them to suit the will of man, then this would seem to negate any idea that celestial influence interfered with the freedom of the will.¹²²

In keeping with the Arabic tradition of borrowing foreign ideas to construct new philosophies and accompany practical applications, Albert inherited these constructs forged by Islamic,

Jewish, and even pagan scholars, and applied them to a defense of astrology. Sometimes, as with the case of Abu Ma' shar, Albert openly incorporated these philosophical arguments into the *Speculum* while directly citing the authors. In other cases the influence may have been unconscious. The result was the transmission of a hybridized body of scientific and philosophical ideas, with effects that reverberated throughout the West well past the medieval period.¹²³ Astrology remained an important, though controversial, academic discipline in the West even beyond the Scientific Revolution.¹²⁴ As long as intellectuals debated astrology's merits, the *Speculum astronomiae*, and the body of arguments woven throughout it formulated by eastern Jews and Muslims, remained a vital component of that debate.¹²⁵

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Notes

1. Albertus Magnus, *Speculum astronomiae*, in Paola Zambelli, *The Speculum astronomiae and Its Enigma: Astrology, Theology, and Science in Albertus Magnus and his Contemporaries* (Boston: Kluwer Academic, 1992); Richard Lemay, "The Paris Prohibitions of 1210/15, the Formula of Absolution of Gregory IX (1231), and the Incipit of Albertus Magnus' *Speculum astronomiae*: Origin and Canonical Character of the *Speculum astronomiae*" (unpublished paper, 1974). I recognize that many still consider Albert's authorship of the *Speculum astronomiae* to be debatable, though I do not find these arguments convincing. There is not room in this study for an analysis of the debate; those who wish to review the points under consideration may examine these studies: Pierre Mandonnet, "Roger Bacon et le *Speculum Astronomiae* (1277)," *Revue neoscholastique de philosophie* 17 (1910), 313-35; P. Mandonnet, *Siger de Brabant et l'averroïsme latin au XIII^e siècle*, 2 vols. (Louvain, Institut supérieur de philosophie de l'Université, 1911), 1:244-48; Aleksander Birkenmajer, *Etudes d'histoire des sciences et de la philosophie du Moyen Age*, trans. Claire Brendel et al. (Wroclaw: Zaklad Narodowy im. Ossolinskich, 1970), pp. 143-45; and Lynn Thorndike, "Further Consideration of the *Experimenta*, *Speculum astronomiae*, and *De Secretis Mulierum* Ascribed to Albertus Magnus," *Speculum* 30 (1955), 413-43.

2. Albert knew no Arabic, but as Tester has detailed, by the end of the thirteenth century the collection of works that would come to be accepted as the canonical corpus of astrological works had been translated into Latin. See S. J. Tester, *A History of Western Astrology* (Woodbridge, Suffolk: Boydell Press, 1987), p. 152.

3. The terms "judicial," "prognosticative," and "predictive" are all virtually synonymous when applied to astrology.

4. Thomas Aquinas, *Summa Theologiae* pars 3, 4.91.2, 2.95.5; idem, *Summa Contra Gentiles* bk. 1, "God," trans. A.C. Pegis (Notre Dame, Ind.: University of Notre Dame Press, 1975), pp. 211, 276; *ibid.*, bk. 2, "Creation," trans. J. F. Anderson, pp. 24, 25-30; idem, *A Shorter Summa*, ed. Peter Kreeft (San Francisco: Ignatius, 1993), p. 142; John D. North, "Medieval Concepts of Celestial Influence: A Survey," in *Astrology, Science, and Society: Historical Essays*, ed. Patrick Curry (Wolfeboro, N.H.: Boydell Press, 1987), p. 5; Thomas Bradwardine, *De Causa Dei contra Pelagium*, ed. Henry Savile (Frankfurt a.M.: Minerva, 1964), pp. 256, 466; and Meister Eckhart, "Sermones et Lectiones super Ecclesiastici cap. 24," in *Die deutschen und lateinschen werke*, vol. 2, ed. Heribert Fischer, Josef Koch, and Konrad Weiss

(Stuttgart: Verlag W. Kohlhammer, 1992), p. 298. Albert's distinction of celestial influence that affected our corporeal substance, but not our soul, was widely accepted, though there was a great deal of disagreement as to whether or not a study of celestial motion could be used to determine future influence upon a person. Nevertheless, even harsh critics of predictive astrology normally accepted celestial influence as an important determinant of the functioning of our bodies. See Birkenmajer, *Etudes d'histoire*, pp. 276-77; and Lynn Thorndike, "A Hitherto Unnoticed Criticism of Astrology: Liber de reprobatione iudiciorum astrologiae," *Isis* 31 (Nov. 1939), 68-78, esp. 76-78.

5. Norman Daniels, *Islam and the West: The Making of an Image* (Edinburgh: Edinburgh University Press, 1962).

6. *Ibid.*, pp. 121, 271, 275; R. W. Southern, *Western Views of Islam in the Middle Ages* (Cambridge, Mass.: Harvard University Press, 1962), p. 13; Marie-Therese D'Alverny, "La connaissance de l'Islam en occident du IXe milieu du VIIe siècle," *L'Occidente l'Islam nell'alto medioevo*, vol. 2 (Spoleto: Settimane di studio del centro italiano di studi sull'alto Medioevo, 1965), pp. 577-78; Elogius, *Liber apologeticus martyrum*, in *Corpus scriptorium muzarabicorum* 12, vol. 2, ed. Juan Hill (Madrid: 1973), pp. 375-76, 398-99, 481, 486-87; and Eneas Sylvius Piccolomini, *Der Briefwechsel des Eneas Silvius Piccolomini* 68, *Fontes rerum Austriacarum* 2, ed. Rudolf Wolkan (Vienna: in Kommission bei Hölder, 1909-), p. 200.

7. Daniels, *Islam*, passim.

8. Thomas Burman, "Tafsir and Translation: Traditional Arabic Quran Exegesis and the Latin Qurans of Robert of Ketton and Mark of Toledo," *Speculum* 73 (1998), 703-32. In 1142 Robert of Ketton completed a translation of the Qu'ran directly from Arabic into Latin at the behest of Peter the Venerable.

9. James Kritzeck, *Peter the Venerable and Islam* (Princeton: Princeton University Press, 1964), pp. 113-52.

10. *Ibid.*, p. 117-28. Peter the Venerable studied the Qu'ran through Robert of Ketton's 1142 Latin translation.

11. Burman, "Tafsir," pp. 703-32.

12. Muslims view both the Old and New Testaments as holy, though corrupt, texts. The Christian patriarchs from Adam forward are revered by Muslims, as is Jesus, though He is considered a prophet, rather than the Son of God. Finally, in the Middle Ages Muslim scholars studied the same Aristotelian texts as their Christian counterparts, and applied Aristotle's philosophy in much the same way as well. See Edward Booth, *Aristotelian Aporetic Ontology in Islamic and Christian Thinkers* (Cambridge, Eng.: Cambridge University Press, 1983); F. E. Peters, *Aristotle and the Arabs: The Aristotelian Tradition in Islam* (New York: New York University Press, 1968); and William Montgomery Watt, *Muslim-Christian Encounters: Perceptions and Misperceptions* (London: Routledge, 1991).

13. Tester, *History of Western Astrology*, p. 152.

14. Richard Lemay, "The True Place of Astrology in Medieval Science and Philosophy: Towards a Definition," in *Astrology, Science, and Society*, ed. Curry, pp. 57-74 at p. 60.

15. Albert makes this point in his *Super Ethica: Commentum et Quaestiones*, ed. Wilhelm Kubel (Aschendorf: Monasterium Westfolorum, 1968), p. 176.

16. David Pingree, "Astrology," in *Religion, Learning, and Science in the 'Abbasid Period*, ed. M. J. L. Young, J. D. Latham, and R. B. Serjeant (Cambridge, Eng.: Cambridge University Press, 1990), pp. 290-99 at p. 290; and Laura Smoller, *History, Prophecy, and the Stars: The Christian Astrology of Pierre d'Ailly, 1350-1420* (Princeton: Princeton University Press, 1994), passim. Thomas Aquinas went so far as to suggest that all terrestrial events depend upon celestial influence. See his *In octo libros Politicorum*

Expositio, ed. R. M. Spiazzi (Rome: Marietti, 1966), p. 305; see also the insightful analysis of this component of Thomas's thought in Tullio Gregory, "Temps astrologiques et temps chretien," in *Le Temps Chrétien de la fin de l'Antiquité au Moyen Age, IIIe-XIIIe siècles*, ed. Jean-Marie Leroux (Paris: Editions du CNRS, 1984), pp. 559-63.

17. Lemay, "True Place of Astrology," p. 61. Masha'allah's *De revolutione*, in his *Tres libri*, provides examples of astrology's usefulness to merchants making investments or setting out on journeys, while Abu Ma' shar's *Flores* demonstrates the ways in which an astrologer can apply his art to such topics as determining the sex of a child, who its father might be, and other questions that could be of vital interest to its relations. See Masha'allah, *De revolutione annorum mundi*, in *Tres libri*, trans. John of Spain (Nuremberg: Ionnem Montanum, 1449), proem; and Abu Ma' shar, *Flores Astrologia* (Augsburg: Ratdolt, 1488), liber IV.

18. Hilary Carey, *Astrology at the English Court and University in the Later Middle Ages* (London: Macmillan, 1992); and Abu Ma' shar, *Flores Astrologiae*.

19. Sheila J. Rabin, "Kepler's Attitude Toward Pico and the Anti-Astrology Polemic," in *Renaissance Quarterly* 3 (Autumn, 1997): 750-70.

20. George Saliba, *A History of Arabic Astronomy: Planetary Theories during the Golden Age of Islam* (New York: New York University Press, 1994), p. 67.

21. *Ibid.*, p. 68.

22. *Ibid.*

23. *Religion, Learning, and Science*, ed. Young, et al., p. xv; George Makdisi, *The Rise of Humanism in Classical Islam and the Christian West, with Special Reference to Scholasticism* (Edinburgh: Edinburgh University Press, 1990), pp. 2, 88.

24. Saliba, *History of Arabic Astronomy*, p. 70; Lemay, *Abu Ma' shar and Latin Aristotelianism in the Twelfth Century: The Recovery of Aristotle's Natural Philosophy through Arabic Astrology* (Beirut: American University of Beirut, 1962), p. xxvi.

25. O. Neugebauer, *The Exact Sciences* (Princeton: Princeton University Press, 1952), p. 144. In this way astrology was not far removed from modern mechanistic theories that are attractive, in part, because of their regularity and ability to explain the universe in a consistent manner.

26. Lemay, *Abu Ma' shar*, pp. xxix-xxx. The casting of astrological elections in order to determine a propitious time to begin important building projects was relatively common in both the Islamic East and the Latin Christian West. See Mary Quinlan-McGrath, "The Foundations Horoscope(s) for St. Peter's Basilica, Rome, 1506: Choosing a Time, Changing the Storia," *Isis* 92 (December, 2001), 716-41.

27. Some Arabic and Latin Christian scholars would also confront the charge that a model of the world that allowed for the possibility of judicial astrology conflicted with God's omnipotence. From the late thirteenth century, theologians frequently discussed the *potentia Dei absoluta* (absolute power, or potency, of God) and presumed conflicts with points of Aristotelian physics, but astrology was not central to this discussion. See Gordon Leff, *The Dissolution of the Medieval Outlook* (New York: Harper and Row, 1976), pp. 28-29; and Etienne Gilson, *History of Christian Philosophy in the Middle Ages* (London: Sheed and Ward, 1955), p. 410. This was one of the issues for Parisian theologians who were involved in formulating the 219 Condemnations of 1277. See Edward Grant, "The Condemnation of 1277, God's Absolute Power, and Physical Thought in the Late Middle Ages," *Viator* 10 (1979), 211-44. For an example of a Christian intellectual who considered astrological beliefs to represent an irreconcilable conflict with God's omnipotence, see the analysis of Charles Trinkaus, "Coluccio Salutati's Critique of Astrology in the Context of His Natural Philosophy," *Speculum* 64 (Jan., 1989), pp. 46-68. Albert did not concern himself with such presumed conflicts between astrology and God's omnipotence: he saw the stars

as a conduit for God's influence that in no way limited His ability to act on the world. See Albertus Magnus, *Summa Theologiae sive De Mirabili Scientia Dei*, Quaestiones 1-50, vol. 1, ed. A. Dionysius Siedler, P.A., Wilhelm Kubel, and Heinrich George Vogels (Aschendorf: Monasterii Westfolorum, 1978), pp. 64, 130; and Albertus Magnus, *Super Dionysium de Divinis Nominibus*, vol. 1, ed. Paul Simon (Aschendorf: Monasterii Westfolorum: 1972), 154-57. Considerations of the compatibility, or lack thereof, between astrological divination and free will dominated the discussion in the thirteenth century, with overt concerns that celestial influence compromised belief in God's omnipotence achieving greater prominence after the Reformation. See Richard Dales, "Robert Grosseteste's Views on Astrology," in *Medieval Studies* 29 (1967), pp. 357-63; and Keith Hutchison, "Supernaturalism and the mechanical philosophy," *History of Science* 21 (1983), 297-333, especially Martin Luther's argument on pp. 315-16.

28. Pingree, "Astrology," p. 297.

29. Lemay, *Abu Ma' shar*, p. 242.

30. David Pingree, *The Thousands of Abu Ma' shar* (Leiden: Brill, 1968), pp. 14-18.

31. *Ibid.*, pp. 18, 33. North has pointed out that Abu Ma' shar's astrology was itself an "amalgam of Hellenistic and Indian astrology." See John D. North, "Celestial influence—the major premiss of astrology," in *"Astrologi hallucinati": Stars and the End of the World in Luther's Time*, ed. Paola Zambelli (New York: Walter de Gruyter, 1986), pp. 45-100. North discusses Abu Ma' shar on pp. 52-61.

32. Lemay, *Abu Ma' shar*, p. 84. For Abu Ma' shar this was different from the passive potency that Plato referred to in the Republic, which is often translated as the "rational soul." For Plato, this soul was separate from the will, which acts at the behest of the rational soul. Abu Ma' shar's concept is closer to the way in which medieval scholars, such as Albertus, viewed Aristotle's intellectual or intelligible soul, though will and intellect are closely combined in Abu Ma' shar, whereas Albert sees will as a component of the intellectual soul. See Plato, *Republic*, trans. Benjamin Jowett (London: Vintage, 1991), pp. 147-73; Jan N. Bremmer, *The Early Greek Concept of the Soul* (Princeton: Princeton University Press, 1987); and Albertus Magnus, *Questiones*, ed. Albert Fries (Aschendorf: Monasterii Westfolorum, 1993), pp. 219-20.

33. Lemay, *Abu Ma' shar*, pp. 82-83, quoting from Abu Ma' shar's *Introductorium maius*: "The third cause of his being, the virtue of heavenly bodies by the will of God produces in him whatever else he has...[including] the differentiation of his species from all others and his individuality...[as well as] the establishment of a suitable harmony between his vital and rational soul on one hand and his body on the other." The translation is Lemay's.

34. Vicky Armstrong Clark, "The Illustrated *Abridged Astrological Treatises of Albumasar*: Medieval Astrological Imagery in the West" (Ph.D. diss., University of Michigan, 1979), p. 22.

35. Lemay, *Abu Ma' shar*, p. 84.

36. *Ibid.*, p. 102.

37. Clark, "Illustrated *Abridged Astrological Treatises*," p. 22. The rest of the information in this paragraph comes from this source.

38. Albertus, *Speculum astronomiae*, p. 264: Nam de contingenti quod erit...antequam sit semper possibile est de esse et non esse...non sequitur ergo antequam esset, non potuit non esse...omne enim contingens...potest et esse et non esse...non enim idem est esse necessario quando est, et simpliciter esse ex necessitate et tamen erit, quia non est necesse illam potentiam ad actum reduci...de eo de quo significatum...nihilominus semper ante hoc potest esse, et tandem revertitur ad naturam impossibilis. Et haec est sententia Albumasaris, a qua tamen famosus Aristoteles in aliquo declinare videtur. All translations from the *Speculum* are taken from Zambelli, *The Speculum astronomiae and Its Enigma*, unless otherwise noted.

39. Zambelli, *The Speculum astronomiae and Its Enigma*, pp. 95-96. Albert appears to have borrowed this doctrine from Abu Ma' shar's *Introductorium maius*, though the formulation was a commonplace that seems to have first appeared in pseudo-Ptolemy's *Centiloquium*.
40. Albertus, *Speculum astronomiae*, passim. Albert references Abu Ma' shar 24 times, and Aristotle twice. One of these references to Aristotle, on page 264, is to explain why Aristotle is wrong to disagree with Abu Ma' shar.
41. Richard Lemay has pointed out that translators applied themselves to Abu Ma' shar's *Introductorium maius* prior to Aristotle's major works. This translation, made in 1140, preceded translations of Aristotle's *De generatione et corruptione* and his *Meteorologica* by a decade or more, and received a great deal of attention. See Lemay, *Abu Ma' shar*, introduction; and Tester, *History of Western Astrology*, p.152.
42. Lemay, *Abu Ma' shar*, p. 64.
43. Albertus, *Speculum astronomiae*, pp. 258-63.
44. *Ibid.*, pp. 218-20: est ligamentum naturalis philosophiae et metaphysicae.
45. *Ibid.*, p. 220: si...ordanavit Deus...mundum istum...velit operari in rebus creatis...per stellas...sicut per instrumenta...quid desideratius concionatori quam habere mediam scientiam, quae doceat nos qualiter mundanorum ad hoc et ad illud matatio caelestium fiat corporum mutatione.
46. *Ibid.*: creatorem creaturarum.
47. Clark, "Illustrated *Abridged Astrological Treatises*," p. 22.
48. Tester, *History of Western Astrology*, p. 152.
49. Saliba, *History of Arabic Astronomy*, p. 32. This is the way that Ptolemy, the second-century Alexandrian astronomer, presents the study of the heavens in his *Tetrabiblos*, also known as the *Quadripartitum* in the West. See Claudius Ptolemeus, *Tetrabiblos*, ed. Frank Egleston Robbins (Cambridge, Mass.: Harvard University Press, 1940), passim.
50. Saliba, *History of Arabic Astronomy*, p. 32. The rest of the information in this paragraph comes from the same source.
51. *Ibid.*, p. 33.
52. *Ibid.*, p. 66; Shlomo Pines, "The Semantic Distinction between the Terms Astronomy and Astrology according to Al-Biruni," *Isis* 55 (1964), 343-49.
53. Albertus, *Speculum astronomiae*, pp. 208, 218: Duae sunt magnae sapientiae et utraque nomine astronomiae censetur ... prima est in scientia figurae celi primi...secunda...est scientia iudiciorum astrorum. My thanks to Thomas Burman for pointing out the literal nature of the Latin translation taken from the Arabic term. Albert had no knowledge of Arabic; as such, he was dependant upon the translations of others, which were often quite literal. However, his adoption of the specific terminology employed in the translations he worked from is indicative of a high degree of borrowing from Arabic sources. Laura Ackerman Smoller notes the conjunction between scholars' level of influence from Arabic sources and their view of astronomy and astrology as separate sciences; see Smoller, *History, Prophecy, and the Stars*, p. 27. Some medieval scholars called what we would now recognize as astronomy the "theoretical" portion of the science, while astrology was the "applied" portion. Hereafter I shall refer to this theoretical part of the science as astronomy, while the applied portion will be called astrology. See Derek Parker and Julia Parker, *A History of Astrology* (London: Deutsch, 1983), pp. 94-95.

54. Parker and Parker, *History of Astrology*, pp. 94-95.
55. Albertus, *Speculum astronomiae*, pp. 208-10. An epicycle was the perfect circle that medieval cosmographers believed each planet made around a point that it orbited as the planet then orbited around the Earth.
56. *Ibid.*, p. 212. Albert states that “it [astronomy] cannot be contradicted, save by someone who opposes the truth.”
57. *Ibid.*, p. 208: *duae sunt magnae sapientiae et utraque nomine astronomiae censetur*. I have supplied my own translation here for Albert’s Latin. While Zambelli’s translations are normally quite good, in this case her translation does not seem to reflect the nuances of the text.
58. *Ibid.*, 220.
59. We should remember that Albert was a philosopher of science, but not a scientist himself. There is no evidence that he practiced astrological divination, nor did he contribute independently to the field. He did creatively blend elements from a wide variety of sources, but astrology as Albert understood it was largely derived from Abu Ma’ shar.
60. Albertus, *Speculum astronomiae*, pp. 218-22.
61. Tester, *History of Western Astrology*, p. 152.
62. Clark, “*Illustrated Abridged Astrological Treatises*,” p. 6. The rest of the information in this paragraph comes from this source. Both Albert and Abu Ma’ shar shared the idea that light was the affecting force that transmitted celestial influence. Albert believed that God imparted the sun with divine power, which then “flowed” downward to the other celestial bodies and eventually to man, in the form of light. See Albertus, *Super Dionysium*, 1:156-57. Albert’s view that rays of light transmitted divine influence was far from universal. For an overview of this subject, see North, “*Medieval Concepts of Celestial Influence*,” pp. 5-18.
63. Nancy Siraisi, *Medieval and Early Renaissance Medicine* (Chicago: University of Chicago Press, 1990), pp. 67-68; Roger French, “Foretelling the Future: Arabic Astrology and English Medicine in the late Twelfth Century,” *Isis* 87 (Sept. 1986), 453-80, esp. 454-56. French stresses the importance of Abu Ma’ shar’s influence on European medicine.
64. Siraisi, *Medicine*, pp. 67-68.
65. Tester, *History of Western Astrology*, pp. 3, 43, 57, 71-72.
66. Abul-Rayhan Muhammad Ibn Ahmad al-Biruni, *The Book of Instruction in the Elements of the Art of Astrology*, trans. R. Ramsay Wright (London: Luzac, 1934), pp. 58, 60, 69, 96-97, 217-24, 262-68, 256-58.
67. *Ibid.*, pp. 269-71.
68. Clark, “*Illustrated Abridged Astrological Treatises*,” p. 7; and al-Biruni, *Art of Astrology*, p. 55.
69. Clark, “*Illustrated Abridged Astrological Treatises*,” pp. 7-8.
70. Fred Gettings, *Dictionary of Astrology* (London: Routledge and Kegan Paul, 1985), p. 231.
71. Clark, “*Illustrated Abridged Astrological Treatises*,” p. 8.
72. al-Biruni, *Art of Astrology*, pp. 149, 275-95; Gettings, *Dictionary of Astrology*, pp. 153-54.

73. al-Biruni, *Art of Astrology*, pp. 265-74, 276-95, 327-30.
74. Ibid., pp. 217-24, 240-54.
75. Ibid., p. 250.
76. Ibid., p. 360.
77. Pierre Brind 'Amour, *Nostradamus Astrophile* (Ottawa: Les Presses de l'Universit e d'Ottawa, 1993), pp. 431-33, passim. Masha'allah's *De revolutione*, discussed on p. 19, provides a perfect example of the ambiguity that one would find in the average astrological judgment.
78. Smoller, *History, Prophecy, and the Stars*, p. 39. Peter d'Ailly asserted that astrological inaccuracies proved "the difficulty of knowing rather than the impossibility of the knowledge."
79. The complexity of this system would have been a strength. Any failed predictions could be seen as the fault of the astrologer, rather than of the system. See Smoller, *History, Prophecy*, p. 20.
80. Lynn Thorndike, *A History of Magic and Experimental Science During the First Thirteen Centuries of our Era*, vol. 2 (New York: Columbia University Press, 1958), p. 527.
81. Albertus, *Speculum astronomiae*, p. 218: Secunda magna sapientia...est scientia iudicorum astrorum. Ptolemy, *The Almagest*, trans. R. Catesby Taliaferro (Chicago: Encyclopedia Britannica, 1952), pp. 16, 5-56, passim; and Betsey Price, "The Physical Astronomy and Astrology of Albertus Magnus," in *Albertus Magnus and the Sciences: Commemorative Essays, 1980*, ed. James A. Weisheipl (Toronto: Pontifical Institute of Medieval Studies, 1980), pp. 155-85 at p. 157.
82. Lemay, *Abu Ma' shar*, pp. 64, 86, 101.
83. Saliba, *History of Arabic Astronomy*, p. 66.
84. Ibid.
85. Francis J. Carmody, "Introduction to *De motibus Caelorum*," in Nur ad-Din al-Bitruji al-Ishbili Abu Ishaq, *De Motibus Caelorum*, ed. Francis J. Carmody (Berkeley: University of California Press, 1952), p. 11.
86. Albertus, *Speculum astronomiae*, p. 209.
87. Ibid., pp. 209-11.
88. Ibid.
89. Carmody, "Introduction to *De motibus*," p. 37.
90. al-Bitruji, *De Motibus*, p. 72.
91. Lemay, *Abu Ma' shar*, p. 242.
92. Albertus, *Speculum astronomiae*, p. 214: "Voluit...Alpetragius corrigere principia et suppositiones Ptolemaei."
93. al-Bitruji, *De Motibus*, pp. 79-80.
94. Ibid., pp. 74-78.

95. Gettings, *Dictionary of Astrology*, pp. 307-8.
96. Al-Bitruji, *De Motibus*, pp. 112-50.
97. *Ibid.*, pp. 99-150.
98. Pingree, "Astrology," p. 294. The rest of the information in this paragraph comes from this source.
99. E. S. Kennedy and David Pingree, *The Astrological History of Masha'allah* (Cambridge, Eng.: Cambridge University Press, 1971), pp. 39-142.
100. Masha'allah, *De revolutione*, proem.
101. *Ibid.*, chap. 1; Al-Biruni, *Art of Astrology*, p. 322.
102. Masha'allah, *De revolutione*, chap. 1. The rest of the information in this paragraph comes from the same source.
103. *Ibid.*, chap. 1.
104. Al-Biruni, *Art of Astrology*, p. 230.
105. *Ibid.*, p. 259.
106. Kennedy and Pingree, *Astrological History*, pp. v-vii; Ptolemy, *Almagest*, trans. Taliaferro, pp. 16, 75-76; and E. S. Kennedy, "Ramification of the World-Year Concept in Islamic Astrology," *Proceedings of the Tenth International Congress of the History of Science* (Paris: Collection des travaux de l'Académie Internationale d'Histoire des Sciences, 1962), pp. 23-43.
107. Masha'allah, *de Receptione*, in *Tres libri*, trans. John of Spain, prologue: Dispositio significator iussu dei...prohibitionem iussu dei.
108. *Ibid.*: Dispositio significator iussu dei...
109. Albertus, *Speculum astronomiae*, p. 234: "Si et tunc aequales fuerint significatores, differe in aliud tempus, vel...supersedere eo, quod Dominus voluit celare a nobis." Compare these ideas with Masha'allah's prologue to *de Receptione*: "Dispositio significator iussu dei, qui si fuerit in esse effectus rei significabit euis effectum et si fuerit in esse prohibitionis significabit eius prohibitionem iussu dei." While Albert does not cite Masha'allah by name in this location, Zambelli points out, quite rightly in my opinion, that Albert is drawing on Masha'allah's *de Receptione*.
110. M. Tardieu, "Sabiens Coraniques et 'Sabiens' de Harran," *Journal Asiatique* 274 (1986) 1-44. Muslim religious leaders granted this Northern Mesopotamian pagan group tolerance by associating them with the unidentified "sabiens" of the Qu'ran.
111. De Lacy O'Leary, *How Greek Science Passed to the Arabs* (London: Routledge, 1951), p. 173.
112. *Ibid.*
113. A. Zahoor, "Translators of Scientific Knowledge in the Middle Ages," (1992, 1997); available from <http://www.cyberistan.org/islamic/Introl3.html>; INTERNET.
114. Thabit ibn Qurra al-Harrani, *De Imaginibus*, in Thabit ibn Qurra al-Harrani and Francis J. Carmody, *The Astronomical Works of Thabit b. Qurra* (Berkeley: University of California Press, 1960), p. 180.

115. Ibid., p. 181: “Cum ergo volueris de ea aperari, incipies sub ascendente...et figurabis imaginiem...ex...stanno vel plumbo vel argento vel auro. Et sculpas super imaginem nomen ascendentis et domini eius et domini hore et domini diei et nomen.” For Sabiens, construction of images provided for direct influence upon the actions of the ruling angels. This was effectively a form of ritual prayer. See H. Corbin, *Temple et Contemplation: Essais sur l’islam iranien* (Paris, 1980), pp. 143-70; and Z. Vesel, “Reminiscences de la magie astrale dans les *Haft Peykar de Nezami*,” *Studia Iranica* 23 (1994), 1-11.
116. al-Harrani, *De Imaginibus*, pp. 181, 182, 188.
117. Nicolas Weill-Parot, *Les “images astrologiques” au moyen âge et à la renaissance: spéculations intellectuelles et pratiques magiques (XIIIe-XVe siècle)* (Paris: Champion, 2002), presents the most in-depth study of the relationship between image magic and the *Speculum*. For the controversial nature of the subject, see especially pp. 435-57.
118. Weill-Parot, *Les “images astrologiques,”* 457. Weill-Parot illustrates that such concerns were by no means universal, nor did fears that image magic involved association with demons mean that church officials systematically refused to employ them. In 1301 Arnaud de Villeneuve prescribed the use of an astrological image for Pope Urban VIII’s kidney stone. Despite the protest of a number of cardinals, Urban followed this prescription and praised its efficacy. For more on the controversial nature of image magic and Albert’s status as an authority on the subject, see Frances Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: University of Chicago Press, 1991), pp. 71-75.
119. Thorndike, *History of Magic*, 2:557.
120. Albertus, *Speculum astronomiae*, p. 270.
121. Ibid., pp. 248-50: Habebit effectum iussu Dei a virtute caelesti...quod si tacite conditiones necromanticae sunt, intolerabilis est.
122. Weill-Parot, *Les “images astrologiques,”* p. 390.
123. The *Speculum* is extant in sixty manuscript copies, spread across Europe and the United States, indicating that this work enjoyed widespread popularity. See Agostino Paravicini Bagliani, *Le Speculum astronomiae, une énigme? Enquete sur le manuscrits* (Sismel: Edizioni del Galluzzo, 2001), pp. 3-4.
124. See Tester, *History of Western Astrology*, p. 181. As late as 1799 the professor of *astronomia* at the University of Bologna was still required to produce an annual almanac for medical use. For an examination of contacts between members of the Royal Society in England and astrologers, and the concomitant continuing perception of astrology as a valuable academic discipline in seventeenth-century England, see Bernard Capp, *English Almanacs 1500-1800: Astrology and the Popular Press* (Ithaca, N.Y.: Cornell University Press, 1979).
125. Both supporters and opponents of astrology appealed to the authority of the *Speculum*, and the work was published as late as 1615. See Albertus Magnus, *Speculum astronomiae: nunc primum e ms. codice in lucem editum: Praemittuntur autem ejusdem authoris libelli, De virtutibus herbarum, lapidum, &c.* (London, 1615). For examples of others using the *Speculum* as a source, see Eckhart, “Sermones et Lectiones,” 2:298; Pico della Mirandola, *Disputationes Adversus Astrologiam Divinatricem*, vol. 1, ed. Eugenio Garin (Florence: Vallecchi Editore, 1946), pp. 66, 94; and Heinrich Cornelius Agrippa von Nettesheim, *De occulta philosophia libri tres*, ed. Vittoria Perrone (New York: Brill, 1992).