

RELIGION AND SCIENCE IN
ABRAHAM IBN EZRA'S SEFER HA-OLAM

(INCLUDING AN ENGLISH TRANSLATION OF THE HEBREW TEXT)

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1 INTRODUCTION

1.1 Abraham Ibn Ezra and Sefer ha-Olam

Abraham Ibn Ezra (ca 1096 – ca 1164) was a medieval Jewish polymath: a mathematician, astronomer, astrologer, Biblical commentator, poet and grammarian. He was born in Tudela in northern Muslim Spain and received his education in the great centers of learning in Córdoba, Christian Toledo and Saragossa. When he was in his forties, he traveled to Rome, which was to be the first stop on a twenty-five year journey through Christian lands, taking him to France and England. During his travels, he made a living out of writing scientific and religious books for the Jewish communities in Christian countries, who did not have access to the Arabic texts that Ibn Ezra had studied.

Whether or not he was aware of it at the time, Ibn Ezra played a prominent role in the transmission of Arabic science to the Latin West by translating Arabic texts into Hebrew and by composing his own texts in Hebrew on various subjects that he had learned in Spain. Although he was highly educated in the sciences, he did not make new and original discoveries in these fields, but his greatest achievements are his success in transmitting several vital pieces of information to the West and transmitting the general scientific world-view of medieval Arabic civilization. He is, for example, credited with being the first to introduce the numerical zero into the West. Because of his achievements in transmitting astronomical data (tables and translations as well as original texts), a crater on the moon is named after him: *crater A Ben Ezra* (O'Connor and Robertson 1999).

In Jewish rabbinic tradition, Abraham Ibn Ezra holds a prominent place mainly because of his very popular Biblical commentaries. These commentaries achieved immediate renown, and more than a dozen “supercommentaries”, which commented on the commentaries, emerged in the 14th century. Today, Abraham Ibn Ezra's commentaries are included in the standard study Bibles, the *Miqraot Gedolot*, of rabbinic Judaism. Because of his extensive wanderings and his poverty, Ibn Ezra has also become something of a folk-hero, the subject of many strange and fantastic tales. In these folk-tales he is presented as the poor wandering sage, who appears suddenly where he is needed and saves a Jewish community, only to disappear again. Usually he is mocked for his poverty and ragged clothes, only to

bring shame on those who ridiculed him when his illustrious identity is revealed¹. (Alexander 1990, 1-6.) In some tales he even has supernatural powers (Weinberger 1997, 55-63).

But to many, Ibn Ezra is best remembered as an expert astrologer. This was the role in which he was best known to his medieval commentators and to the Christian population that came to read the Latin and French translations of his astrological works. But these astrological works are still the least researched of his massive literary output. The aim of this study is therefore to advance the understanding of this long neglected part of Ibn Ezra's writings by providing a translation and an analysis of one of these astrological texts: *Sefer ha-Olam* (the Book of the World).

Abraham Ibn Ezra composed a series of astrological works, of which *Sefer ha-Olam* is the seventh and last. Its name is derived from its subject matter, which is *mundane astrology* (Lat. *mundus*, the world), the branch of astrology concerned with entire nations, weather, politics, economy and other world events, as opposed to *genethliological astrology*, which was concerned with the fate of individuals based on the time of their birth. Medieval mundane astrology forms an important background context for *Sefer ha-Olam*, but it is not its role in the history of astrology that I will focus on in this study. Instead, I will place *Sefer ha-Olam* within the context of a much wider question; that of the relationship between science and religion in history. I will be examining the ways in which science and religion have been perceived to have interacted in the past, from theories of perpetual conflict to assessments of essential harmony verging on ethnocentrism and to the recognition of individual complexity. From the insights that such a review provides, I will formulate a typology of the kinds of interaction between religion and science in a medieval context. It is within this framework that Ibn Ezra's life, thought and sources are evaluated.

Finally, I will use this typology to analyze in depth three passages in *Sefer ha-Olam* that reveal, in light of his other writings, the complexity of Ibn Ezra's opinions on the relationship between science and religion. In this manner I hope to bring to light a more coherent picture of Ibn Ezra's attitude to the connections between scientific and religious knowledge than has been achieved in the past.

¹ This motif of the *tsaddiq*, the holy man, who arrives disguised as a beggar, is familiar from later *hasidic* stories in particular.

1.2 Previous research

There is an enormous amount of research on Ibn Ezra's biography, his Biblical commentaries and his poetry. By contrast, his scientific and astrological works have received substantially less scholarly attention. Study of Ibn Ezra's Biblical commentaries began in the late Middle Ages, and has continued unabated since (Lancaster 2003, 22-25). Some of Ibn Ezra's poetry is included in the liturgy, which also explains the interest in his poetic works. In the modern era, largely thanks to the 17th century philosopher Baruch Spinoza, Ibn Ezra became known as a pioneer of Biblical criticism and rational theology (Harris 1993, 130) which were important aspects of *haskala*, the Jewish Enlightenment. In this tradition, Ibn Ezra's astrological commitments became something of an embarrassment and were often attempted to explain away. In recent years a renewed interest in mysticism and astrology have influenced the recovery of this central part of Ibn Ezra's thinking. (Langermann 1993, 30; Lancaster 2003, 35.)

In the 19th century, Moritz Steinschneider, “one of the founders of modern Jewish bibliography and scholarship” (Lancaster 2003, 31) added to the knowledge of medieval Judaism by his meticulous recording of surviving manuscript material, and also commented on Ibn Ezra (Steinschneider 1895; 1964). In England, Michael Friedländer furthered the knowledge of Ibn Ezra's thought and biography (Friedländer 1877; 1895), but much of his work is now superseded (Lancaster 2003, 32).

Y.L. Fleischer, who became the foremost biographer of Ibn Ezra, extended his inquiries to many of the astrological texts and he also published editions of some of them². The text used as the basis for the translation in this study is one of his editions. Fleischer felt he needed to justify his interest in astrological texts. He was hoping to find biographical data in these texts, and his treatment of the astrological texts was part of his overall project of gathering biographical clues from all of Ibn Ezra's texts. In this he succeeded and greatly increased our knowledge of the sage's life and times. (Fleischer 1929; Silver 1990, 318-320.) But his efforts did little to further the understanding of his astrological texts a such, which was not at all part of his objective.

² Sefer ha-Me'orot (1933), Sefer ha-Olam (1937), Sefer ha-Te'amim (1951) and Sefer ha-Mivharim (1969).

Raphael Levy also showed interest in Ibn Ezra's astrological texts, although again the study had external motives. For Levy, the reason for addressing these texts was linguistic, and more particularly, French. It so happens that the first part of the astrological encyclopedia of Ibn Ezra, *Reshit Hokhmah*, was translated into Old French by one *Hagin le Juif* in the 13th century, and is thus very valuable as a source on medieval French lexicography (Levy 1927, 19-32, 65). The focal point of Levy's work is thus its importance in this area, and his efforts culminated in the first scholarly edition and translation of an astrological work by Ibn Ezra (*Reshit Hokhmah*, Levy & Cantera 1939). For Levy, the intrinsic value of the text was found in the information it provided for the history of astronomy, the history of didactic literature and the history of the French language (Levy 1939, 14-15.) He did however, make the important conclusion that Ibn Ezra's astrological texts occupied an important place among medieval astrological literature (Levy 1927, 65).

The study of Ibn Ezra's Biblical commentaries focused for a long time on identifying elements of rationalism, neoplatonism and aristotelianism and on analyzing his exegetical approach (Langermann 2006, 9-12; Greive 1973), lines of inquiry still vigorously pursued. The great amount of astrological data in his commentaries was often mentioned, but rarely inspired research as such. It was to take a long time before an interest in Ibn Ezra's astrological thought in itself would awaken.

A new interest in astrology as an element of the history of science began in the 1920's and was influenced by the work of Otto Neugebauer and Lynn Thorndike, and was greatly reinforced by the pioneering work on medieval Islamic astronomy and astrology made in the 1960's and 1970's by Edward Kennedy and David Pingree. The inspiring effect of the work of the latter two was connected to the fact that medieval sources on astrology were predominantly in the Arabic language. Today, a master's programme in the cultural role of astrology is available at the University of Wales in Lampeter, under the jurisdiction of the Department of Archaeology and Anthropology, an indication of the serious academic interest in astrology as a cultural factor in history and today.

The last two decades have witnessed further interest in the scientific and astrological elements of Ibn Ezra's thought. Tzvi Langermann has studied the connections between Judaism and astrology in Ibn Ezra's Biblical commentaries. He has focused on Ibn Ezra's

astrological interpretations of such Biblical topics as animal sacrifices, the scapegoat ritual, the peculiarities of the Holy Land and the theologically laden question of determinism and the special status of the Jewish people (Langermann 1993, 28-74). Mariano Gómez-Aranda has studied the role of scientific elements in Ibn Ezra's commentaries on Job and Ecclesiastes. He has found that Ibn Ezra considered Ecclesiastes as a book dealing with the laws of nature (including astrological laws), but couched in religious terms. (Gomez-Aranda 2006, 339-370.) The marginality of the study of Ibn Ezra's astrology in comparison with the study of his other writings is effectively illustrated by a symposium held in Spain in 1989 on "Abraham Ibn Ezra and his time". Of the forty-five presentations on Ibn Ezra included in the publication of the proceedings, a mere three were studies in his astrological works. One of these three was a detailed study of new manuscript findings in Catalan (Díaz Esteban ed. 1990).

This marginality was partly due to the extensive work yet to be done on the identification and classification of manuscripts. The slow work of mapping and critically editing manuscripts of Ibn Ezra's scientific texts has however produced fruits in more recent years. Renate Smithuis has recently presented a complete listing of Ibn Ezra's astrological works in both their Hebrew originals and in their Latin translations³, along with new discoveries (Smithuis 2006). Shlomo Sela and Gad Freudenthal have introduced a much needed chronological listing of all of Ibn Ezra's commentaries and scientific texts, excluding only his poetry (Sela and Freudenthal 2006). These lists and evaluations, stemming from meticulous work with the manuscripts, are invaluable to the furthering of a proper understanding of Ibn Ezra's scientific texts and indeed of his thought as a whole, as they provide us with an increasingly complete picture of Ibn Ezra's numerous works. Of his scientific texts, a great number of manuscripts still remain unstudied (Smithuis 2006, 300), and there is thus much left to do in this field.

Currently the greatest expert on Ibn Ezra's scientific and astrological texts is certainly the Israeli hebraist and historian of science Shlomo Sela, who since the 1990's has focused on Ibn Ezra's scientific thought. His are without question the most impressive studies to date on the scientific and astrological works of Ibn Ezra (see Freudenthal 2002). In 2003 he published his massive *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science*, including detailed analysis of Ibn Ezra's entire scientific corpus, his scientific terminology,

³ It seems that Ibn Ezra may have composed some of his works originally in Latin, but there are also later Latin translations of most of his Hebrew works, Smithuis 2006

his astronomical-astrological world-view and its relationship with Judaism. Added was also a thorough examination of Ibn Ezra's relationship with his main source, Claudius Ptolemy. Sela examines Ibn Ezra's scientific works in terms of recurring themes, topics that Ibn Ezra brings up time and again in several of his writings, in commentaries as well as in technical tracts. Sela's work is the first to add to the mere linguistic and referential study of Ibn Ezra's astrological works, like that of Levy and Fleischer, and to analyze them in terms of their connections to the history Jewish cultural and ideological currents.

Sela has very recently published a translation of *Sefer ha-Te'amim* (2007), the second book of Ibn Ezra's astrological encyclopedia. This is a fully annotated, Hebrew-English edition of both versions of the text, and as such it is the second of Ibn Ezra's astrological works to acquire a scholarly translation. Sela's translation is a major contribution to the appreciation of Ibn Ezra's astrological texts and in his introduction, Sela reveals his intention to make proper annotated and translated editions of all the rest of Ibn Ezra's astrological texts (Sela 2007, 3). This would indeed be highly desirable.

As I have attempted to show above, there is still much to do in this field. Several of Ibn Ezra's astrological works still remain untranslated and virtually unstudied. Only Sela has delved into the astrological contents of these texts in any real way. One of the texts that have heretofore not been translated is *Sefer ha-Olam*. Nor has any study been devoted to this text in particular. It is naturally mentioned in several scholarly works by Levy, Smithuis and Sela, but no sustained analysis of the text has been undertaken.

While several studies have focused on the role of science in Ibn Ezra's religious thought, the opposite question has barely been touched upon. Again, it is Sela who has provided the most profound insights on the subject, but not even he explicitly raises the question: *what is the role of religion in Ibn Ezra's scientific texts?* There has also been no study explicitly addressing the question of what the relationship between science and religion is in Ibn Ezra's technical texts. Neither have there been any efforts to use or create a typology of the kinds of interaction between science and religion present in these texts.

1.3 The purpose of this study

For the reasons outlined above, I have decided that a twofold study would best further the study and understanding of these issues. Firstly, my intention has been to make the text of *Sefer ha-Olam* understandable in its original context by translating and representing the text as faithfully and as precisely as possible in its scientific and historical contexts. This

first task I have felt is necessary since there is no previous translation of this text to refer to. Secondly, I have also wished to place the text in a much wider context, that of the dialogue between science and religion in history. This dual task has resulted in two interconnected studies: one that is the text itself in translation and with explanatory notes on its contents, its context and its sources, and the other, containing a systematic analysis focused on the particular theme of religion and science. I have felt that this second task has also been necessary since there is no previous study devoted specifically to this text or this question.

The goal of the translation is not so much to be a definitive annotated translation of *Sefer ha-Olam* as to make the rather technical astrological contents of the text accessible to the uninitiated reader. Another benefit of this strategy is that the themes related to science and religion found in the text and analyzed in the study, will thus be observable in their original context. The goal of the systematic analysis has been to address the question: *what is the relationship between religion and science in Sefer ha-Olam?*, or as specified by the theoretical considerations in chapter 2.3, rather: *what are the relationships* (in plural) *between science and religion in Sefer ha-Olam?* I will begin to answer this question by first examining the meaning of the concepts “science” and “religion” as they are to be understood in the medieval context of *Sefer ha-Olam*. Then I will look at the role that the relationship between science and religion played in Ibn Ezra's life and in his thought in general. I will also briefly look at how this question is represented in his choice of sources. Here I have chosen the sources which are central to *Sefer ha-Olam* in particular and to “science and religion” in general. Finally I will conduct a more detailed analysis of the interaction between science and religion in *Sefer ha-Olam* specifically. For this purpose I have extracted three passages that I deem especially relevant for this question, and I will examine the different interactions between science and religion in these three passages.

A central preliminary question is the place of astrology in this arrangement. Is it a science or a belief system? The question is all the more pertinent as astrology is the prime subject of the text. I will not attempt to answer this question on any ontological level, but rather, I will investigate its relationship with astronomy and its relationship with religion separately, and only as they were conceived by Ibn Ezra. As a rule of thumb, however, we can say that astrology was indeed a science for Ibn Ezra, although not in exactly the same way as astronomy was.

2 SOURCE, METHOD AND THEORETICAL FRAMEWORK

2.1 Primary source: Sefer ha-Olam (the Book of the World)

2.1.1 Edition, manuscripts, versions and date

The translation in this study is based on Fleischer's edition of Sefer ha-Olam (Fleischer 1937). Yehuda Leib Fleischer is known as Abraham Ibn Ezra's foremost biographer, and he wrote several works on Ibn Ezra in Hebrew (Fleischer 1928-1930; 1947). He also made editions of theretofore unpublished texts by Ibn Ezra: of Sefer ha-Te'amim, Sefer ha-Mivharim, Sefer ha-Me'orot (see list below) and the edition of Sefer ha-Olam used here. Fleischer was no expert on astrology nor a historian of science, but was primarily interested in biographical information on the great exegete. In his preface to Sefer ha-Olam, Fleischer explains that he undertook the editing of an astrological text because these have some value for historians of science, and for elucidating medieval scientific terminology. It is clear that he felt that some justification was required for studying an astrological text. The astrological subject matter, Fleischer assures us, is in itself useless (Fleischer 1937, 3).

The Fleischer edition leaves much to be desired in terms of clarity and printing quality. It is also entirely devoid of critical notation. Sela calls Fleischer's edition "very poor" (Sela 2003, 67). Fleischer was, however, aware of the limitations of his endeavor. In the preface he states:

"I have not intended to investigate the matter in depth, because I merely wanted to publish the manuscript that I had with me, in order to give the material into the hands of professional experts, and therefore I did not add any notes to the body of the text."
(Fleischer 1937, 4-5.)

Fleischer made his edition from the manuscript Vatican BAV. Ebr. 390. It contained the whole astrological encyclopedia (Fleischer 1937, 4). Ibn Ezra's astrological texts are found

in a total of 115 manuscripts around Europe, and 21 manuscripts including this version of the text of Sefer ha-Olam are found in 15 different libraries in Europe and Jerusalem (Smithuis 2006, 299-333). A great number of these manuscripts remain unstudied. According to Fleischer, the manuscript that he has used is dated 5196 in Hebrew years (Fleischer 1937, 4), which means 1435 in the Gregorian calendar.

As is the case with many of Ibn Ezra's texts, Sefer ha-Olam was written in two distinct original versions. Versions should be strictly distinguished from copies, as the former are different versions originally written by Ibn Ezra, while differences between copies are due to copyist errors or agendas. The version edited by Fleischer is known as Sefer ha-Olam A, and the other as Sefer ha-Olam B. The latter version remains in manuscript form only⁴, except for some fragments edited and translated by Sela (2003, 362, 368, 381). According to Sela, Sefer ha-Olam B differs in content from Sefer ha-Olam A by the lengthy combinatorial analysis (the 120 conjunctions, see page xx) present only in version A, and the astrological analysis of the birth of the monotheistic religions present only in version B. Fortunately the latter is covered by Sela (Sela 2003, 68-69; see also section 4.2.1 of the present study).

Now remains the matter of determining the date and place of composition. Version A is easily dealt with: A colophon in one of the manuscripts⁵ gives the date of completion as Marheshvan 4909 (cf. Sela and Freudenthal 2006, 36), which means November 1148 CE. In other manuscripts, the date of composition is given as 4908. Thanks to certain latitude figures given by Ibn Ezra as examples for calculation, it can be ascertained that it was written in the town of Béziers in southern France. (Sela and Freudenthal 2006, 20-22.)

The date and place of composition of version B has proven to be a more difficult task for the scholars. Moritz Steinschneider, the great 19th century historian of Jewish medieval literature distinguished them by marking the two versions Sefer ha-Olam A and Sefer ha-Olam B. Fleischer presents as his opinion that version B was written earlier, while Ibn Ezra was still in Lucca in Italy, as a response to an even earlier date given by Halberstamm, who assumed it was written in Rome. (cf. Fleischer 1937, 5). Steinschneider had not intended his markings to be chronological in character. Indeed both versions report the same year as

⁴ About 10 manuscripts of version B are extant, and 20 more manuscripts have not been identified as to which version they are (Smithuis 2006, 299-333).

⁵ Folio 10a in the München Bayerische Staatsbibliothek Cod. Hebr. 304.

the year of composition, and Sela wrote in 2003 that he assumes that version B was written only a few months later than version A. In 2006, Sela states that we know it was written between 1148 and 1154 (Sela and Freudenthal 2006, 36-37). The place is either southern or northern France. It seems evident that Ibn Ezra composed new versions for all his astrological works, of which only part have survived (Sela 2003, 57-74).

However, as we will here concern ourselves with version A, we can comfortably conclude this chapter by asserting that the text we have before us was originally composed in November 1148 in Béziers, France, as part of a great astrological encyclopedia, which was written in its entirety during the same year that our author arrived in this town.

2.1.2 Textual context: the astrological encyclopedia

Sefer ha-Olam was never intended as an independent treatise. It is the last in a series of textbooks, which Sela has more accurately described as an “astrological encyclopedia” (Sela 2001, 115). The encyclopedia is composed of the following parts or chapters, some of which have already been mentioned:

1. *Reshit Hokhmah* (The Beginning of Wisdom) is a basic textbook on astrological interpretation: it explains how to recognize the constellations, and describes the numerous properties of the planets and signs, the aspects, the divisions of the ecliptic into quadrants that correspond to the four cardinal directions, the astrological houses, the conditions under which planetary influences are weaker or stronger than usual, other relationships that the planets may have with each other, the lots and the directions. Edited and translated by Raphael Levy and Francisco Cantera (1939).

2. *Sefer ha-Te'amim* (The Book of Reasons) is basically a commentary on *Reshit Hokhmah*. Ibn Ezra quite clearly planned from the beginning to have two separate texts (Sela 2007, 1-6), of which the first, *Reshit Hokhmah*, simply lists the correspondences and meanings of the astrological concepts with minimal argumentation, and the other, *Sefer ha-Te'amim*, presents the reasons behind these concepts. Here he also presents scientific issues that were debated in his time, which is highly informative reading. Edited and translated by

Shlomo Sela (2007).

3. *Sefer ha-Moladot* (The Book of Nativities) is a handbook in genethliological astrology, which means the interpretation of birth-charts for individuals, and individual anniversary horoscopes. The introduction features a highly significant warning that general predictions, including mundane astrological predictions, always override individual predictions. Edited by M. Y. Bakal (1995), translated by Meira Epstein (2008).

4. *Sefer ha-Mivharim* (the Book of Elections) is a handbook in *electional astrology*, the branch concerned with finding the astrologically auspicious moment for a given endeavor, such as a business transaction or a sea voyage. The main technique was observing the position of the moon in the astrological houses. Edited by Y. L. Fleischer (1969), not translated.

5. *Sefer ha-She'elot* (The Book of Interrogations) is a handbook in the type of astrology aimed at answering specific questions, such as the whereabouts of a missing person, the identity of a thief and other similar practical issues. Edited by M. Y. Bakal (1995), not translated.

6. *Sefer ha-Me'orot* (The Book of the Luminaries) is a handbook in medical astrology based on the influence that the moon exerts on the health of human beings. Edited by Y. L. Fleischer (1933), not translated.

7. *Sefer ha-Olam* (The Book of the World) a handbook in mundane astrology, the object of the present study. Its main technique is observing the conjunctions of Saturn and Jupiter. Edited by Y. L. Fleischer (1937), first translation included in the appendix of this study.

All seven texts were written in two versions⁶, and the first version of the whole encyclopedia was written in its entirety in 1148. Ibn Ezra had written an earlier astrological text on very general astrological issues named *Mishpetei ha-Mazalot* (Book of Judgments of the Zodiacal Signs) sometime between 1146 and 1148, but this text does not form part of the encyclopedia. This can be asserted on the grounds that as opposed to Ibn Ezra's other astrological texts, it does not refer to the other texts and the other texts do not refer to it. Ibn Ezra frequently refers to both previous and following texts *within* the astrological

⁶ Smithuis has argued that most were written in no less than three versions (Smithuis 2006, 243).

encyclopedia described above. In *Sefer ha-Olam*, which is the last part, he refers only retrospectively to the earlier parts. Thus it seems reasonable to assume that the seven above mentioned texts form a planned whole, while the single earlier text does not. Perhaps he wrote it on commission for someone in 1146 or 1147, and soon realized that he could never include every relevant issue in a single text, which prompted him to begin an entire encyclopedia on the subject. (Sela 2003, 69-74.)

Since *Sefer ha-Olam* is part of such a whole, it is of great importance that it is read together with the other parts. The fact that it is the last one only enhances this need: Ibn Ezra would have assumed that the reader would already be familiar with the topics of the preceding texts. However, for the purposes of this thesis, I have only had opportunity to consult the first three, because the latter three texts have very poor availability. This is not necessarily fatal to an analysis of the contents of the *Sefer ha-Olam*, as the texts 4-6 are concerned with specific branches of astrology that are not particularly closely related to mundane astrology. By contrast, the three first treatises are essential for the understanding of *Sefer ha-Olam*, since it is here that Ibn Ezra describes and argues for his views on astrological doctrine generally. It seems likely that treatises 4-6 would add only marginal information to the picture drawn by these four principal texts. Nonetheless, for a more authoritative study, even those three texts should be properly consulted.

2.1.3 Motivation: technical handbook

In general, we may hold that the purpose behind all of Ibn Ezra's numerous scientific and astrological texts was a didactic one. This is easily proven by the numerous references by Ibn Ezra himself to his aim to make things easily understandable for students, as well as the existence of what Sela calls "solved exercises". They were meant for readers who wished to learn a specific scientific subject matter, as opposed to texts which aim to bring entirely new information or theory to the scientific community. Ibn Ezra's texts include little or no scientific innovation, but they present information that was new to the audience for which it was intended: Jews living in Christian countries and who did not have access to the Arabic learning that Ibn Ezra had received in Spain. Because of this didactic nature of his texts, we should rightly not expect original solutions or theoretical innovations when reading his books, but instead the presentation of the opinions of many authorities, the

evaluation of those differing opinions, and sometimes Ibn Ezra's own opinion among the others. Much like a modern scientific textbook, Ibn Ezra's books refer to several authorities and present alternative solutions to relevant problems that were current in his own time. (Sela 2003, 85-86.)

We must thus bear in mind that the text we are examining is not a philosophical text, where Ibn Ezra would present his world-view in a cogent and systematic manner. In fact, he has written no obviously philosophical text that we could easily refer to, but instead we must search for his world-view from several places in his Biblical commentaries and other texts.

The text must be treated as what it is; a technical text primarily intended to teach a specific scientific subject. This specific subject is *mundane astrology*. Mundane astrology was the branch of astrology concerned with predicting the future of entire nations, groups or geographical areas. It included what we might call political astrology, that is, the future of kingdoms, countries and their relations; wars, peace and conquests. But it also included weather prediction, because the weather affected every nation, especially the coming of rains and droughts, which also directly affected the harvest. Thus it also entailed what we might call economical astrology, and we read in Sefer ha-Olam directions for how to predict the future price of olive oil and of wheat, both of which were major economical factors in the Middle Ages (Sefer ha-Olam 1937, 15; see also the appendices of this study).

While Sefer ha-Olam is a text designed to teach the scientifically uneducated the techniques and concepts they need for picking up the astrological craft themselves, Ibn Ezra's textbooks are not only lists and descriptions of the correspondences that are necessary in the craft like most astrological handbooks of the time. The reader is initiated into the central debated issues in the field at the same time as he is being taught its basic concepts. Ibn Ezra also does not shy away from admitting outright when he does not know the answer to a question, or when he believes a revered authority has been surpassed by later scholars (Sefer ha-Olam 1937, 10, 11).

Sefer ha-Olam is also an excellent example of the type of mathematical astrology that, in the revered footsteps of Ptolemy, attempted at all times to introduce as much and as up-to-date astronomical knowledge as possible into astrological doctrine. This is relevant because there was also another type of astrology, one more related to magic, concerned

with lucky and unlucky days and such matters, which was widely practiced in the medieval market-places and shops. (Saliba 1994, 70.) It seems that Ibn Ezra wanted to present a mathematical astrology based on the sound principles of astronomy and sharing in its reliability.

A typical feature of Ibn Ezra's work is that he often mixes religious content with grammatical, cosmological and various scientific material (Sela 2003, 12). Much scientific, including astrological, material is to be found in his Biblical commentaries, and they are therefore indispensable for understanding some of the passages in *Sefer ha-Olam*. For the commentaries on the Pentateuch and *Yesod Morah*, I have used Norman Strickmans's English translations (1988, 1995, 1996, 1999, 2001, 2004).

Outside of scholarly investigation proper, Ibn Ezra has attracted attention by the astrologer Meira Epstein, who has made three English translations of Ibn Ezra's astrological texts: *Reshit Hokhmah*, *Sefer ha-Te'amim* and *Sefer ha-Moladot*. Although these translations do not entirely meet academic standards and unfortunately do not include the original Hebrew text, I have felt compelled to use one of them in this study. Epstein's translation of *Sefer ha-Moladot* (2008), which is the only existing translation and which thus has provided me access to a text I would otherwise not be acquainted with. I do, however, treat this translation with some caution, especially as the original Hebrew text has not been available to me.

2.2 Method

2.2.1 Translation and historical analysis

Three consecutive methods are employed in this study. The necessary first step in making *Sefer ha-Olam* intelligible is to translate it from the original Hebrew into English. In this work I have relied heavily on Sela's studies on Ibn Ezra's terminology. Of paramount importance for the success of this endeavor has been Sela's recent translation of *Sefer ha-Te'amim* (2007), which incorporates both the Hebrew original and a high-quality English

translation along with explanatory notes. In a number of ways, this work has been the model to which I have aspired in my own translating efforts. Sela has also written an in-depth chapter on Ibn Ezra's scientific vocabulary entitled "The creation of a New Hebrew Scientific Vocabulary" in his *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (2003), which I have also found very useful. The fruits of my labour can be reviewed in the appendix (appendix 2.) of this study, along with a brief introduction to Ibn Ezra's linguistic scheme.

The second method used is historical analysis, resulting in a set of explanatory notes which are also situated in the appendix alongside the translation. The purpose of these notes is to clarify the astrological contents of the text by providing their context in medieval astrological practice and lore. It is my intention that these notes will also place *Sefer ha-Olam* into its natural historical context as a text of mundane astrology. This means in practice that I have tried to identify Ibn Ezra's sources wherever possible, and examine the historical background of the astrological ideas that he puts forth.

Historical analysis is also in the background of the selection of the three passages that I will analyze further in the context of science and religion. There are, as Sela has noted, a set of recurring themes in Ibn Ezra's texts. Ibn Ezra recapitulates these themes almost verbatim in several texts, a side-effect of his constant travels and his consequent lack of access to even his own texts (Sela 2003, 151-158, 238-323). Three of these themes are to be found in *Sefer ha-Olam*. I have compared what Ibn Ezra writes in these three passages with his treatment of the same topic in his other texts. I have then compared the textual contexts in which a given issue is presented in different texts in order to determine the role that the treated issue plays in *Sefer ha-Olam*.

2.2.2 Systematic analysis

Finally I have also chosen a particular viewpoint, that of the relationship between science and religion, and examined the three passages which provide clues about this relationship within Ibn Ezra's thought. The method here employed is *systematic analysis*, which may be considered a branch of content analysis. Systematic analysis is the name used in Finland

for a cluster of methods commonly applied to analyze texts in theology, philosophy and religious studies.

In general, systematic analysis, like content analysis, is based on analyzing texts in terms of their key concepts, their line of argumentation and their background assumptions. Although this sometimes entails the analysis of single concepts or claims within the text, more often it includes the unraveling of implicit background assumptions. Many times the object is to find a so called “structuring principle” which makes the material maximally coherent and can thereby be assumed to have motivated the author. This is typically so with texts in which the author has clearly wished to present a systematic view of the world – the author's philosophical outlook. According to Jolkkonen, systematic analysis is a method in which one examines and describes a conceptual system by examining and describing its structural parts and their interrelations. (Jolkkonen 2007, 12-19.)

Systematic analysis can be conducted from a theoretical point of view, where an external theory is applied to the material. This type of analysis is often called “theory-laden”. It can also be conducted from the point of view of the source, so that theoretical tools arise from the conceptual framework of the text itself. This is called “theory-immanence”. A theory that has risen from the text can be substantiated by recourse to the author's other texts or those of other authors within the same interpretational tradition. (Leppisaari 1998.) In this study, I have attempted to combine both theory-laden and theoretically immanent approaches. This means that while I have applied the external theoretical framework of “religion and science in history”, I have also felt the need to revise the given theoretical typology in order to better suit the circumstances of the text.

The basic steps of any source-based systematic analysis are: a) reducing the material to manageable units, b) clustering and c) abstracting (Tuomi & Sarajärvi 2002). This has in practice meant a) isolating three passages for further analysis, b) focusing of the interrelationships between three central traditions: the astronomical, the astrological and the religious tradition of rabbinic Judaism and c) analyzing these interrelationships in terms of a typology of kinds of interaction between religion and science, as presented by John Polkinghorne and revised for the purposes of this study.

2.3 Theoretical framework: religion and science in history

2.3.1 The conflict thesis

A dialogue between science and religion can be said to have been one of the most pervading projects of western civilization. It still continues today in many fields of the humanities and between the humanities and the exact sciences. In this dialogue, claims are often made concerning past situations in which science and religion are seen as having been in conflict, or in harmony, as the case may be. Too often, history is being utilized for the purposes of present ideology and grave simplifications are made about science and religion in history. It is therefore the task of historians of science and of historians of religion to correct such undue generalizations. In this chapter, I will outline the major developments in the historiography of science and religion, and specify the theoretical standpoint from which I will approach the material in Sefer ha-Olam.

The question of science and religion in history has been accompanied by tenacious popular notions, as is well illustrated by the fate of the "conflict thesis" propagated by John William Draper and Andrew Dickson White in the late 19th century. Draper and White both proposed that there has been a perpetual struggle between religion and science throughout history. Draper's *History of the Conflict between Religion and Science* (1874) and White's *History of the Warfare of Science with Theology in Christendom* (1896) both listed instances of what they believed was the inevitable conflict of interests between the two traditions. They were published in a time when science seemed to be triumphant in all areas of life. The notion that science and religion have been mutually hostile throughout history has been vigorously and almost unanimously rejected by historians since the 1970's, but a wider public has only very slowly begun to abandon it (Russell 2002, 4).

There are several problems with the "conflict thesis". One is that in searching only for instances of conflict it precludes any possibility of other relations between religion and science. During most of their shared history, science and religion have been not only in conflict, but often entirely independent, sometimes mutually encouraging and even at times symbiotic. (Russell 2002, 8.) The conflict thesis has no way of dealing with this variety of relations. Even the classic cases of the church's opposition to Galileo's observations and the current and long-standing feud between creationism and Darwinism are not as one-dimensional as they might seem, as is shown by modern historical research. The conflict, which in itself is indisputable, has in both cases had political, social, and personal

dimensions that should not be simplified into a straightforward conflict between science and religion (Blackwell 2002, 105-115; Moore 2002, 208-217).

The conflict thesis also relies on the notion of inevitable progress and assumes that science has and always will emerge victorious from the postulated struggles. In doing so it obscures the rich variety of ideas concerning revelation and nature that have been presented throughout history and it exaggerates historical discussions and arguments by presenting them as major conflicts. The descriptions of the conflict thesis are thus "excellent drama but impoverished history". (Russell 2002, 4-9.) As John Hedley Brooke reminds us, "In the literature of popular science, there is a tendency to make the science more portentous in its implications than a more sober estimate would allow. To claim that a new discovery has major implications for religious belief is a well-tried way of catching public attention" (Brooke 2006, 301). Nevertheless, the conflict thesis reigned supreme for almost a century.

2.3.2 Reactions to the conflict thesis

In reaction to the hegemony of the conflict thesis, other thinkers attempted to show that modern science would not have been possible at all without the doctrinal base of religion, usually Christianity. The famous "Merton thesis", brought forth by Robert K. Merton (1910-2003), stated that the rise of modern science was connected to Protestant pietism in the same way as the Protestant work ethic was to capitalism in Max Weber's theory. In a similar vein, Pierre Duhem in his massive *Système du Monde - histoire des doctrines cosmologiques de Platon à Copernic* (1913), argued that the medieval catholic church was a conducive force to science instead of being an obstacle. In the 1970's, Stanley Jaki maintained that the prime reasons why oriental religions had not produced modern science, as the Judeo-Christian world had, were a cyclical view of history and an organic view of nature. Thus Judeo-Christian notions of linear time and immutable divine laws was a necessary requisite for the emergence of modern science (Jaki 1974). Much science-historical research still focuses on determining by whom or in what cultural sphere something was first discovered. While such a focus may serve some historical purposes,

great care must be taken not to overstate the religious, national or political role of that discovery and what it in fact means for a religious world-view (Brooke 2006, 300). In the final analysis, the same problem that had crippled the conflict thesis also plagued these apologetic theories: they were equally incapable of explaining examples in history of the opposite tendency.

During the 20th century, an increasing number of historians began to question and criticize the conflict thesis as part of a general critique of “presentism” and “essentialism” in historical study. By “presentism” is meant the tendency to interpret past occurrences only in the light of the present, with the benefit of hindsight as to which theories would turn out to be successful. By “essentialism” is meant the view that there are some kind of essential and unchanging categories “religion” and “science”, which can be easily observed in past situations (Wilson 2002, 14). This critical movement managed to expose a great number of anachronisms in the history of science and religion. The avoidance of presentism was also related to the rejection of what Maurice Mandelbaum called “the retrospective fallacy”, where the historical person's future was seen as fixed, inasmuch as it was already the past for the historian. Mandelbaum argued that the historian must treat that “past future” as uncertain, as it was for the historical person himself/herself (Mandelbaum 1971). Essentialism in turn was to be replaced by “contextualism” which emphasized the original context in its entirety and strove to ignore the long-term influence of an idea, which could not have been known to the historical person. (Wilson 2002, 14.)

2.3.3 The complexity thesis and renouncing ethnocentrism

In more recent decades, it was recognized how much an idealistic view of science had informed the conflict thesis and how much an apologetic commitment to religion had influenced the outcome of the theories of Merton and Jaki, not to mention the blatant ethnocentrism. Historians now turned to what became known as “the complexity thesis”, acknowledging that no historical event could be reduced to mere conflict or harmony between science and religion (Wilson 2002, 23-26), and that what we find when we look at any one case in its full context is a remarkable complexity in the relations between science

and religion.

Without pushing an apologetic agenda, the historian needed to be able to account not only for polemical views expressed in the past but also for those who saw common features in the two activities of religion and science. Brooke cites an editorial by Donald Kennedy in the journal *Science*, who says that “my love of science has much to do with its mystery” (cf. Brooke 2006, 294). A conscientious historical assessment of the relationship between science and religion should be able to account for cases like the thought of Albert Einstein, who maintained that “the most beautiful experience we can have is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science” (Jammer 1999, 73). Kennedy and Einstein are by no means isolated cases, and we will encounter this basic view of the religious and the scientific in Ibn Ezra's thought as well. In the past, a calling that is experienced at once as scientific and as religious has not been unusual, and is observable in many other scientific minds of the past (Brooke 1991).

Wide generalizations and simplifications regarding entire world-religions should also be avoided. Such are also the attempts to solve the historical question known as “the Needham problem”, posed by Joseph Needham in the 1950's. While Needham's own study concerned the history of science in China, it has since spread out to include the entire following question: why did Islamic and Chinese societies, both at one time technologically superior to Europe, “fail to develop modern science”? A contextually sensitive standpoint must reject such questions as futile and chauvinistic. Many scholars, notably Jack Goody, have criticized the Needham problem as being erroneous, as it rests upon the assumption that the European development is the product of some kind of “natural progress”, and the “failure” on the part of other civilizations to produce identical developments need to be explained in terms of a “deficiency” on their part. Also, this question totally ignores the stimulating effect of medieval Islamic science on early modern western science. (Goody 2006, 125, 133-134, 148.)

2.3.4 Four different types of interaction

The complexity thesis effectively does away with over-simplifying, over-arching theories

of science and religion, but it does not offer any alternative way to generalize or systematize interactions between religion and science. It may suffice as a theoretical standpoint to say that the relation is always necessarily complex. But in practice, this provides little in the way of tools with which to analyze a material from the point of view of religion and science.

I have therefore turned to the current discussion of the ontological relationships between science and religion to find a workable typology. The theologian and physicist John Polkinghorne has actively taken part in the current discussion on the relationship between religion and science. Without here taking any stand on the issue of the current state of that relationship, which is far outside the scope of this study, I have found his typology of different kinds of interaction between science and religion quite useful as a theoretical starting-point. Polkinghorne has suggested, following Ian Barbour, four types of interaction between science and religion (Polkinghorne 1998, 20-22):

1. The first is the classic case of *conflict*. In this type one of the disciplines dominates and dictates the rules of the other. Today this would be exemplified by extreme scientism and Biblical literalism.
2. The second type is *independence*, which means in this context that science and religion deal with two separate realms and can therefore be in neither harmony nor conflict. This is the stance where science is seen to be concerned with the “how”, while religion is concerned with the “why”. As Polkinghorne notes, however, the two questions are rarely in reality entirely separated. Extreme pragmatism, concerned exclusively with “how”, is untenable as a general characterization of science because scientists are usually very much interested in knowing why things work as they do (Polkinghorne 1998, 13).
3. The third type is *dialogue*. This view promotes the idea that a dialogue between scientists and theologians is both possible and potentially constructive on those questions in which their interests overlap. Currently such questions are the emergence of life, the history of the universe and the relationship between mind and body.
4. The fourth type of interaction is *integration*, which is exemplified by attempts to bring scientific and religious thinking together into one unified discourse. This entails the merging of the concepts of science and religion to the greatest possible degree and the construction of a new field of knowledge composed of “science-and-religion”. Current examples include attempts to interpret the nature of Christ in terms of an evolutionary “new emergent”; as the next step in human evolution.

Polkinghorne's typology is in principle useful and accurate. It is, however, devised for the

current discussion, not for the medieval, and is consequently in part better suited to modern than to medieval conditions. As there is no equivalent typology designed for the Middle Ages that I am aware of, I will use Polkinghorne's as a starting-point but make a few important modifications. The resulting typology is not intended to be a universal one, applying to all medieval circumstances, but is instead the product of a dialogue between the contents of Sefer ha-Olam and Polkinghorne's typology. This derived typology is as follows:

1. The first type of interaction is straight-forward *dominance*, and is essentially equivalent to Polkinghorne's *conflict* type. Probably the most well-known assessment of the relationship of religion and science in the Middle Ages is the characterization of science as the “handmaiden of theology” (see, *inter alia*, Lindberg 2002, 62). This phrase, originating with Saint Augustine, is used to denote the attitude that science should serve the purposes of religion, and only then is secular science permitted. By dominance I mean both social domination in the form of power wielded by institutions, and also conceptual domination, which is simply the idea that religion can and should radically alter scientific categories, or vice versa. The notion of a “handmaiden of theology” has in recent decades been criticized on several accounts (Langemann 1999, 5; Lindberg 2002, 62). Here I will use dominance as a category of interaction in analyzing the thought of Ibn Ezra as revealed by the contents of Sefer ha-Olam.

2. The second type is similar to Polkinghorne's *independence*, but with a completely different emphasis. Instead of holding that science and religion occupy different realms of reality, this is the idea that religion's place is outside of science, wherever science is unable to reach. Science is called upon to give answers wherever possible, but that which science can not explain, is the rightful dominion of religion. As a consequence of this view, the role of religion can only diminish with the progress of science. This idea is similar to the metaphysical “*God of the gaps*”-argument. The phrase “God of the gaps” was coined by C. A. Coulson in the 1950's to denote the theological argument that whatever science failed to explain was due to divine action, implying that God only lived in the “gaps” of scientific knowledge. Now almost entirely abandoned as a theological argument, “God of the gaps” was widely used in the Middle Ages and to some extent even by the early moderns like Newton (Brooke 1991, 28-29, 137). There is no metaphysical discussion concerning the existence of God in Sefer ha-Olam, nor elsewhere in Ibn Ezra's thought, but there is a structurally similar and religiously informed instruction on whom to turn to when science fails to provide explanations.

3. Polkinghorne's category of *dialogue* was largely taken for granted by Ibn Ezra and his contemporaries. A dialogue between Greek natural philosophy and revealed religion was the predominant intellectual project of the period. A categorical rejection of Greek natural philosophy was extremely rare, and everybody thus assumed that the two bodies of knowledge needed to be engaged in some form of dialogue. One might say that for medieval thinkers, *dialogue was the default position*. Therefore, I suggest another kind of interaction, one that rises from the historical study of religion and science.

My suggestion for the third type is the *triangle-situation*, where there is more than two contestants involved. This is when science forms part of a religious argument that is really directed against another religious denomination or group or when religion is faced with two different forms of science and reacts differently to each. This type of interaction brings into focus the plurality of both *sciences* and *religions*. To illustrate this type of situation, Brooke has described the context in which Newton's theory of gravity was received by religious authorities. The Anglican Church suspected Newton's thesis of *Socinian* tendencies and therefore of heresy. The Socinians were a post-Reformation sect that rejected the doctrine of the Trinity and the divinity of Jesus. They based their belief on rationalism and restricted God's omniscience to only that which *must* necessarily happen, and not that which only *may* happen and is dependent on free will. The religious opposition to Newton's theory was thus not a simple case of religion opposing science, but equally of an internal struggle within the Church. (Brooke 2006, 296.) Again, the case of Galileo, the favorite example of the conflict theorists, involved besides the Copernican and the Aristotelian, also a third competing cosmological system: the system of Tycho Brahe. (Brooke 2006, 297.) The two examples clearly show that there is often more than one "religion" or more than one "science" involved in the debates. In the case of Ibn Ezra, the astrological tradition was such a third party, actively interacting with both astronomy and religion.

4. The fourth type of interaction is equivalent to Polkinghorne's *integration* of science and religion. This idea is presented by Michael Polanyi and Umberto Eco as a religiously inspired aesthetic sense of *symmetry, balance or proportion* within scientific knowledge itself. It represents a kind of experienced fusion between science and religion, and religion is thought to inform science as it were from within, as in the above statement by Einstein. Developments in the philosophy of science has also shown that the epistemic virtues of simplicity, elegance and symmetry have played a role in many past scientific theories and

also in the successes that these theories have enjoyed (Polanyi 1946; 1958). This was particularly true of medieval science (Eco 1959, 28-42). The centrality of notions of proportion and symmetry in astrology is evident from the importance it assigns to geometrically symmetrical and analogous relations.

In chapter four we will see how these four types are manifested in Ibn Ezra's thought and in *Sefer ha-Olam* in particular and how the actual text further complicates a neat typology. Before I turn to the text however, I shall explore the meanings of the concepts “science” and “religion” as they are represented in the medieval context of Ibn Ezra. After that it is necessary to discuss the role of science and religion in Ibn Ezra's life, thought and in his choice of sources.

2.4 Definitions: “science” and “religion” as medieval categories

2.4.1 Science

What do I mean when I use terms like “science” and “religion” when I speak of the Middle Ages? In religious studies, it has become painfully obvious how difficult, or even impossible it is to produce a definition of religion that is suited to all purposes. This is equally true of science (Ketola 1998, 28-31). In the Middle Ages, in a time, place and culture far from our own, science meant something different from today, and it is the purpose of this section to explore these meanings.

Brooke (1991, 6-11, 18) has argued that there is good reason not to make rigid *a priori* definitions for either “science” or “religion” when their relationship is studied in a historical framework. Not only is a universal and functioning general definition for either phenomenon very hard to maintain, but if such a definition could be achieved, it might obscure the many nuances that do not fit these definitions. The classic example is again that of Newton: in his groundbreaking *Mathematical Principles of Natural Philosophy* (1687), he explained the planetary orbits in terms of gravity; a milestone of modern science. Newton, however, believed that this gravitational force in turn should be ascribed

to an omnipresent God. Even though his theory perpetuated the notion of natural forces behind natural phenomena, the very word “force” had a religious connotation for Newton himself and many of his contemporaries. The point that Brooke makes, and I believe rightly so, is that if we decide beforehand what constitutes “science”, we may impose upon the historical thinker definitions that arise more from modern concerns than from those of his own time. (Brooke 1991, 6, 18.)

According to David C. Lindberg “there was nothing in the medieval period that corresponded even remotely to modern science. What we do find in the Middle Ages are the roots, the sources, of modern scientific disciplines and practices – ancestors of many of the pieces of modern science, which bear a family resemblance to their offspring without being identical to them.” (Lindberg 2002, 58) On the basis of this genetic and analogous relationship, we are justified in calling medieval science “science”, but we should be aware of the differences between the modern and the medieval categories.

In Islamic civilization, within which Ibn Ezra was educated, science was denoted by many terms, like *'ulum al-qudama'* (ancient sciences) or *'ulum al-falsafiyya* (philosophical sciences) and *al-'ulum al-nazariyya* (rational sciences), which emphasize the pre-Islamic, rational and philosophical character of these fields. These were distinguished from *'ulum al-'arab* (sciences of the arabs) or *'ulum al-din* (religious sciences), which were used to denote linguistic and religious disciplines like grammar, lexicography, religious law, qur'anic commentary and philosophical theology (Dhanani 2002, 76). A similar situation was dominant in medieval rabbinic Judaism within the Arabic cultural sphere.

Ibn Ezra wrote about a great number of different sciences. The Hebrew word that Ibn Ezra and other medieval Jews used for “science” in general is *hokhmah*, which literally means “wisdom”. He never makes a sharp distinction between religious and natural sciences. The “science” to which Ibn Ezra refers includes Greek natural philosophy, astronomy, arithmetic, geometry, astrology and Pythagorean notions of numerical symbolism. The terminology he applies to the branches of science that he studies is often *ad hoc* and idiosyncratic. Thus in *Yesod Mora*, a late philosophical text, he distinguishes between astronomy (*hokhmat ha-kokhavim*), astrology (*hokhmat ha-mazzalot*), and even uses the word “natural science” (*hokhmat ha-toledet*) as a generic term (Yesod Mora 1995, 21), but these terms are not applied consistently throughout his work (Sela 2003, 12-13). In Ibn

Ezra's time, there was no established scientific terminology in Hebrew, and very little scientific material had been produced before Ibn Ezra⁷. Astrology was a valid science for Ibn Ezra, although he did make a clear distinction between astrology and astronomy. I will return to this topic in section 3.2.2. where I will argue while astrology and astronomy were interconnected, for medieval scholars they were nonetheless two different things.

There was thus a plurality of sciences, and they did not confront religious notions as a monolithic whole, but the interactions varied according to the type of science involved: religious sensibilities found little cause for offense in pure arithmetical theory or in theoretical geometry. On the other hand, astrology had many features that provoked resentment among traditionalist religious thinkers. In this study, when I speak of “science”, I mean the medieval notion of science, which included astrology, numerology as well as more rigorous scientific subjects. When I wish to denote only the latter, I will refer to “exact sciences”, comprising only arithmetic, geometry and astronomy.

2.4.2 Religion

If science was something very different in the medieval period from what it is today, the cultural category “religion” closely resembled the one in use in everyday speech today. It was generally assumed that everyone belonged to one of the three monotheistic traditions. Learned people were also aware of Hindus, Zoroastrians and pagan peoples at the outskirts of the Muslim empire. In this sense, “religion” was membership in a social group with commitments to a distinct historical and textual tradition. There were easily discernible parallels between the three monotheistic faiths; all three had their own sacred texts, their own oral traditions, their own calendars, places of worship and so on, which provided the formula of “a religion”.

Certainly each group believed that they were the ones with the correct interpretation of God's will, but it was accepted that there were other interpretations. In section 3.2.1 we will see that a kind of religious relativism, inspired by sufism, was common among Andalusí intellectuals, both Muslim and Jewish. This does not mean to say that medieval

⁷ Before Ibn Ezra, only Abraham Bar Hiyya (1070-1136) had composed scientific texts in Hebrew. All earlier philosophical and scientific texts written by Jews were in Arabic.

Spain was the paradise of *convivencia* that it has sometimes been made out to be (Menocal 2002, for a critique see Ben-Sasson 2004). But the existence of several faiths in approximately the same sense as we understand the category “religion” today, seems undeniable. This category, for example, allows Ibn Ezra and his contemporaries to make mundane astrological predictions for "the Jews" or for "the Muslims" as a group (Sefer ha-Olam 1937, 19).

Religion was also contrasted against other parts of culture. In the life of an individual, religion was distinguished from the activities of agriculture and commerce, for example. This definition of religion makes it possible for astrological doctrine to hold that the 9th astrological house is the one governing long travel and religious faith, whereas the 6th for example governs chronic illnesses and slaves in the life of the individual (Reshit Hokhmah 1998, 88-89). “Religion” is in this definition one area of life among others.

For Ibn Ezra, the relevant religious tradition was that of rabbinic Judaism. While Ibn Ezra often points out that he does not wish to contradict the words of the rabbinic sages, he does in fact contradict them many times. It has therefore been questioned whether Ibn Ezra indeed was very learned in the Talmudic traditions. Some have also suggested that he paid lip service to the rabbis while planting his radical views within his texts. There seems to be no doubt, however, that Ibn Ezra was a deeply religious person, which is clearly observable in his religious poetry. (Langermann 2006, 16.)

Just like there was a plurality of sciences, interacting independently with religious notions, so there was a plurality of “religions”. This means not only the three great monotheistic traditions, but also internal groupings. Within Judaism the Rabbanites camp, for which Ibn Ezra championed, was opposed by the Karaites, and some of Ibn Ezra's discussions of scientific issues find their meaning only in the context of the controversies between the two religious camps. Thus “science” could become the bone of contention between two opposing religious groups.

Because Sefer ha-Olam is a scientific text, in the sense of “science” outlined in the previous section, I have in practice been searching it for religiously significant material to indicate a relationship between science and religion. What then has passed as “religiously significant” in this search? I have found that “religion” comes in four forms in Sefer ha-Olam: “religion” can be a) reference to a religious group like “the Jews”, or it can be b)

reference to rabbinic authority or c) to the God of Israel, or d) reference to the Biblical text. Concerns which are pertinent for any one of these very central elements of rabbinic Judaism, can in my opinion safely be considered “religiously significant material”.

3 ABRAHAM IBN EZRA: LIFE, WORKS, VISION AND SOURCES

3.1 Ibn Ezra's life and works

3.1.1 Fifty years in Spain

Abraham ben Meir Ibn Ezra was born in 1089 or 1093 in Tudela, a town on the Ebro river in northern Spain. Tudela was a wine-growing town and was still under Muslim rule at the time of Ibn Ezra's birth, but was conquered by Alfonso I of Aragon in 1115, when Ibn Ezra was still a young man. Tudela had a comparatively sizable Jewish community, and while it did not remain entirely unaffected by the change in power, the *reconquista* did not constitute a catastrophe for the Jewish communities. Northern Spain had for a long time been a border-region between the Christian kingdoms and the Islamic al-Andalus, and the Jews were by Ibn Ezra's time used to a mixed multitude of religions and ethnicities in the northern cities like Tudela and Saragossa. (Lancaster 2003, 1-2; Baer 1966, 46-47, 52-53.)

The Muslim area was in Ibn Ezra's time divided into a number of small independent city states, known as *taifas*, but until the beginning of the 11th century, under the Umayyad prince *Abd al-Rahman*, al-Andalus⁸ had been a great Muslim caliphate in Spain, remarkable for its intellectual achievements. The Jews of al-Andalus had distinguished themselves in all areas of intellectual life: in poetry, in sciences, in philosophy. Here they had actively taken part in the Arabic culture that surrounded them, while still retaining their own religious practices. This was possible because of a generally liberal religious policy in Abd al-Rahman's time and for a long time after him. During the politically divided time of the city states, the Jews in fact suffered little, as they were popular in the

⁸ Al-Andalus was the Arabic name given to the Iberian peninsula while it was under Muslim control between 756 and 1492.

many courts for their linguistic and administrative skills, their trade-connections and their political trustworthiness. The latter was due to the fact that Jews by definition could not aspire for the throne, and had no allegiance with any certain ethnic groups that might do so. (Makki 2003, 50-60; Scheindlin 2003.)

But changes were coming. Because of the constant attacks from Christians in the north (who were also divided, and by no means a unified force), powerful Berber armies from Morocco were invited by some of their Spanish Muslim brothers to aid them in securing the territory for the faithful. The Berber troops were successful in this task, but once there, were in no hurry to leave the peninsula. The Berbers had a very different interpretation of Islam than did the Arabs that had ruled hitherto Andalusia⁹, and their growing influence on the area meant decreasing religious tolerance. It was thus very volatile times for Jews, but there were still many ways in which Jews in Spain could make a decent living, in particular in the growing business of translation. Despite the intimidating Berber presence in Iberia, Christian forces conquered new territory, steadily chipping away bits of the Muslim rule of Spain. Toledo had been taken in 1085 and Saragossa in 1118. The new Christian masters of a city wanted to make the most of the intellectual wealth of the Arabic culture they encountered, and thus translators were needed in ever greater numbers. (Chazan 2006; Baer 1966.)

Translation from Arabic into Latin or the vernacular was performed to a great extent by Jews of these borderland areas. Among the first texts to be translated were, incidentally, scientific, occult and astrological texts (Burnett 2003, 1038-1039). Many Jews also stayed in Muslim Spain despite declining conditions for minorities. Throughout the Middle Ages, the Jewish community in Spain was by far the largest in Europe, but from the middle of the 12th century onward, a slow voluntary movement of Jews from Muslim Spain to Christian lands began. In the first few decades of the 12th century, there was a growing sense of doom among Jewish thinkers, and many believed that Jewish life in Iberia was ending. (Chazan 2006, 95-96.) There was talk of the year 1130 as the year of the coming of the *moshiach* (messiah) (Baer 1966, 71), and in 1140 a new wave of Berbers took over Andalusia, and the Almohades, as they called themselves, were even more fundamentalist than the earlier Almoravides. Earlier that same year, Ibn Ezra left Spain and never returned.

Little is known for certain about Ibn Ezra's fifty years in Spain. Of his family we know

⁹ For a detailed analysis of ethnic differences in Muslim Spain, see Guichard 2003.

only that he had a son, Isaac, who died before his father. Several of Ibn Ezra's elegies to his son have survived (Weinberger 1997, 92-95). We know that he knew a number of illustrious scholars (Sirat 1985, 104) and rich men for whom he composed laudatory poetry. We know nothing for certain about where he studied or what, and whether he had good relations with the Muslims and Christians or not, nor of his actual patrons. (Silver, 1990, 319-320.)

Neither is it known what Ibn Ezra's profession was in Spain. Silver suggests that he may have been a secretary to a Jewish vizier like his son Isaac is known to have been, or an envoy or a diplomat (Silver 1990, 321). Similar suggestions have been made by others, based on the number of illustrious names in his poetry. I find it surprising that no one has suggested one of the most obvious possibilities; that Ibn Ezra was a professional astronomer and astrologer. Let us consider this: after he left Spain, he wrote on many topics, but astrology is one of the most frequently featured. He wrote practical guides for the use of the *astrolabe* and translated and commented on the *astronomical tables of al-Khwarizmi*, the two chief tools of a serious astronomer-astrologer. And he wrote a seven-part series of practical handbooks on all branches of astrology. Evidently his interest in astrology was neither fleeting nor superficial. The practical and detailed nature of his astrological works also points in this direction. These are not works on the philosophy of astrology, but step-by-step guides on how to make correct astrological judgments. I suggest therefore that Ibn Ezra studied and practiced primarily astrology and astronomy while he lived in Spain. This could in many ways explain his familiarity with people in high social positions, and is not precluded by his writings in other fields. This would also provide a new possible answer to the much studied question of his reason for leaving Spain.

3.1.2 Reasons for departure

In 1140 Abraham Ibn Ezra traveled from Spain to Rome, alone and with little or no money, according to his own words in a state of alarm (Weinberger 1997, 5). Many historians have been interested in his reasons for leaving. Was it the unstable political state of his native country that propelled him to seek refuge in Christian lands, as Fleischer has maintained (Fleischer 1929, 329-330)? This suggestion is countered by the fact that the Almohad invasion began only after he had already left. According to Silver, there are several hints in Ibn Ezra's texts that allude to a problematic marriage and maybe divorce that had left him without funds and reputation. (Silver 1990, 320.) Or was it a yearning to spread his

knowledge to the Jews in Christian areas, who were significantly less educated in the sciences, which inspired him to personally take that learning to them (Lancaster 2003, 3, 10)? We know that Ibn Ezra supported himself financially with his writings (Lancaster 2003, 10), which in itself explains the sheer number of texts. And if he arrived in Rome lonely and shaken, what kind of trouble had he run into in Spain?

There is one alternative that has not, as far as I know, been considered, and which springs from my above suggestion that Ibn Ezra may have been a professional astronomer-astrologer. According to George Saliba astrology had become increasingly attacked by religious authorities in Muslim Spain in the early 12th century, and astronomers had begun to separate themselves from the condemned practice by demonstrating the religious usefulness of astronomical calculation for time-keeping, essential for the religious calendar (Saliba 1994, 57). Ibn Ezra may thus have found himself in a double predicament, being a member both of an increasingly unwanted religious minority and of a profession shunned by not only the majority religion but also by fellow scientists who feared those religious authorities. Meanwhile, astrological learning was more than welcome in the Christian kingdoms (Burnett 2003, 1038), which was something he must have witnessed in his youth in Tudela.

3.1.3 Ibn Ezra in Latin Europe

Whatever reasons he had for leaving Spain, Ibn Ezra arrived in Rome in 1140. In the 12th century, Rome was no longer a political center of any great importance, but it retained its importance as the religious center of catholic Christianity, as of course it still does today. Just two years before Ibn Ezra arrived, Rome had been shaken by the struggle of Pope *Innocent II* with the “antipope” *Anacletus*, who had been of Jewish origins. While this ecclesiastical crisis did not result in anti-Jewish official statements, the atmosphere must have been somewhat tense for the Jews of Rome. (Lancaster 2003, 3.)

Of the Jews in 12th century Rome we are lucky to have a description by a Jewish traveler

called *Benjamin of Tudela*, who traveled all the way around the Mediterranean basin only two decades after Ibn Ezra. Benjamin informs us that at the time of his visit, about 200 Jewish families were living within the city of Rome, and that these Jews held honorable positions and paid no tribute. (Benjamin of Tudela 1907, 4). The Jews of Rome were in many ways mediators between European Jewry and official Church doctrine. Thus they bore a particularly heavy responsibility but also enjoyed a status unseen among Jews in other countries. The Jews of Rome were highly respected as a community learned in the Talmud, but were conservative and not particularly interested in the sciences (Chazan 2006, 122-125). It seems that Ibn Ezra's attempts to introduce scientific concepts in Rome were not well received (Lancaster 2003, 6).

In 1145 he moved on to Lucca. In contrast to Rome, Lucca's Jews supported the sage quite eagerly (ibid.) During his stay in Lucca, he composed his first, shorter set of Biblical commentaries. The commentaries he wrote in Italy were sparse in scientific excursions. According to Sela, Ibn Ezra still imagined he would be able to return to Spain, where proper scientific texts were available (Sela 2003, 332-333). From *Sefer ha-Olam B* we learn that he had also made astronomical observations for astrological purposes in both Lucca and Pisa (Sela 2003, 26). This also seems to support my suggestion regarding his profession.

Ibn Ezra traveled by boat from Venice or Genoa to Provence and arrived first in Narbonne, a bustling multi-cultural trading town that had a Jewish settlement dating back to the 5th century. But apparently he had been in contact with the rabbis of Béziers while still in Italy, because he quickly left the great city of Narbonne for this rather small town, and arrived in Béziers in 1148. The Jews of Provence were much more accustomed to the influence of Arabic learning, closer as they were to the Spanish border where the translation and transmission-process was most active. Here Ibn Ezra found much more understanding for his way of thinking, and indeed his productivity reached new heights while in Béziers (Lancaster 2003, 11-13). It was here that he composed the first version of his entire astrological encyclopedia, and he finished the whole work in 1148, the same year that he arrived (Sela and Freudenthal 2006, 20). It was in all probability a commissioned work.

A surviving quote by *Yediah ha-Penini ben rabbi Abraham* of Béziers states that "our fathers told us of the joy of our rabbinic leaders in meeting him as he [Ibn Ezra] passed through, and how he began to open their eyes" (Lancaster 2003, 13; Sirat 1985, 274-7). This is likely to be more than just polite Jewish reverence for learning, since many illustrious hispano-Jewish scholars had taken up residence in southern France, like the

Kimhi and the Ibn Tibbon families. Nor should we forget that it was in Provence that in the second half of the 12th century the next great chapter in Jewish intellectual history would begin: the *kabbalah* (Benbassa 1999, 33). This should not be taken to mean that Ibn Ezra alone was responsible for planting the seeds of mysticism, but instead it tells us about the spiritual soil in southern France at the time of his visit. The Christian majority population of southern France were living at the time in a “hotbed of heresy”; or expressed in another way, it was open and hungry for new spiritual ideas. This spiritual volatility was due to the proximity of Islam and to the lack of centralized government; Provence was a loose confederation of rather weak counties. (Chazan 2006, 78-83.) This receptivity was present among Provençal Jews as well, and in all probability affected the positive reception of Ibn Ezra's astrological knowledge in this place. He composed the entire astrological encyclopedia in its first version here in Béziers, as we have seen.

We do not know exactly when Ibn Ezra moved on to northern France, only that in 1155 he wrote his commentary on the Book of Daniel there. He reports "Rodus" as his place of sojourn, and while it has been debated which northern French town this refers to, it is now largely accepted that it was Rouen. (Lancaster 2003, 13.) In this time-period, northern France was part of an entirely different cultural entity from southern France: while southern France was still controlled by the Catalan counts of Barcelona, the north-western part of what we now call France was then part of the Norman kingdom which also encompassed England. The Jews of Rouen therefore had many contacts with their brothers across the channel (Chazan 2006, 78, 154; Lancaster 2003, 14).

Arriving in Rouen Ibn Ezra fell seriously ill and took a vow that if he survived his illness he would write a new version of his commentary on the Pentateuch, a longer one including all the scientific excursuses he wanted to add. His commentary on Daniel also implies that he had some kind of apocalyptic dream after which he believed that the Christians would soon vanquish what he considered the evil Berber Almohades, whose presence in his beloved Spain pained him more and more with the passing of time. (Lancaster 2003, 14.) According to Sela, the new commentaries which he did write on his recovery from his illness (although most of them are lost), reveal that he had now accepted that he would not return to Spain, and this affected the way he wrote. Now there was a sense of urgency in his wish to replant the seeds of the Andalusí intellectual heritage that he feared would otherwise be completely lost. (Sela 2003, 331-335.)

In 1158 Ibn Ezra traveled across the channel to London, probably using the contacts of someone he had befriended in Rouen. England, *Angleterre*, meant the edge of the world, and from the point of view of Ibn Ezra and of Spanish learning, it may have seemed like precisely that. The Jews led a fairly protected existence in England at the time. They had

settled in the time of William the Conqueror, Henry I had encouraged Jewish settlements for the benefits their trade brought him and after a period of destructive anarchy, they had been protected by Stephen during the 2nd crusade. In 1158, under the long and mostly peaceful reign of Henry II, Jews in England mainly prospered, while Henry's successor, Richard the Lionheart, would be more averse to the Jews. (Chazan 2006, 154, 158.)

While in England, Ibn Ezra, now an elderly man of seventy, wrote his first and only philosophical treatise, *Yesod Mora we-Sod ha-Torah* (The Foundation of Awe and the Secret of the Torah) couched in the form of a commentary on the *mitzvot*¹⁰. Since *Yesod Mora* was begun and finished in the very year of his arrival (Friedländer 1895, 140-141; Sela and Freudenthal 2006, 22), it seems likely that his arrival in London was prompted by an invitation and commission to write a philosophical work on the *mitzvot*. The following year he wrote *Iggeret Shabbat* (a Letter from the Sabbath), an allegorical prose work on the correct time to begin the Sabbath. This work was motivated by his vigorous rejection of Rashbam's¹¹ interpretation that the day begins in the morning, which is contrary to traditional *halakha*. Ibn Ezra feared that this would lead to people not sanctifying Sabbath eve (Lancaster 2003, 20).

Soon after this, history loses track of Ibn Ezra. In 1161 we find a horoscope for a child made in his name in Narbonne (Friedländer 1985, 154), but it is uncertain whether it is genuine. It is generally assumed that he died in 1164 (Friedländer 1877, 201-202; Fleischer 1928, 250, 256), but no consensus has been reached over where he met his fate; suggestions vary from England to Narbonne, to his home-town Tudela, and even the Holy Land. The two former alternatives both seem plausible (Lancaster 2003, 20).

3.1.4 The role of science and religion in Ibn Ezra's life

Ibn Ezra lived in a politically volatile period in Jewish history. Challenges included the Berber Almohades in Spain, the reconquista in northern Spain and crusaders in western Europe. The major outcome of his endeavors was undeniably the dissemination of

¹⁰ The *mitzvot* are the Biblical commandments and prohibitions.

¹¹ *Rashbam* is an acronym for Rabbi Shmuel ben Meir (1085-1158), who was a leading tosafist in Ibn Ezra's time, and was the grandson of Rashi, the famous founder of the tosafist school.

scientific learning to the Jews in Christian areas. Beginning with the latter part of the 12th century, the very period in which Ibn Ezra was productive, the Latin world would experience a major intellectual renaissance due to the flood of new knowledge arriving mainly from Arabic Spain (Haskins 1927). Ibn Ezra's was also a time in Jewish history marked by a shift from a great concentration of Jews in the Islamic countries to a growth of the Jewish communities in Christian lands: France, England and Germany. (Chazan 2006, 1-5.)

If we look at the challenges Ibn Ezra faced during his journey, a fascinatingly complex picture of religion and science emerges. Let us consider once again my suggestion that Ibn Ezra may have been a professional astrologer-astronomer and that his reason for leaving was related to an intensification of hostility toward astrology on the part of the ruling Muslim authorities and a subsequent distancing of astronomy from astrology. Since for Ibn Ezra, astrology was a valid science, he may have faced the situation where the majority religious authority changed its attitude toward one science and strongly favored another science, astronomy.

The relationship between science and religion was again relevant in Rome, where conservative religious traditionalists rejected the new scientific information that was presented to them by Ibn Ezra, something which surely must have frustrated him. By contrast, the religiously and intellectually volatile situation in southern France welcomed such knowledge. It is ironic that toward the end of his life, he would be the one defending rabbinic tradition against what he considered the excessively liberal interpretation of Rashbam.

Ibn Ezra's travels took him through a fascinating spectrum of Jewish intellectual history; from the sophisticated and liberal Spanish schools through the prominent but conservative Talmudists in Rome, to the vibrant and volatile southern French mentality that was soon after to give birth to the kabbalah, and the exegetically groundbreaking *tosafists* in northern France. The century following Ibn Ezra would be labeled by the mysticism of the kabbalah and the maimonidean¹² controversies on rationalism. We know that he influenced both these currents (Scholem 1946, 86; Langemann 2006, 9). As a person, we are confronted with the picture of a proud, intelligent and lonely figure, a wanderer and intellectual who

¹² Controversies regarding the thought and work of Moses Maimonides (1135-1204), for many the foremost medieval Jewish philosopher.

was branded by a deep disappointment in the passing of the Spanish intellectual project that once had enabled the Jews to rise to such intellectual heights.

A complex relationship between religion and science is discernible also in the ways in which Ibn Ezra's texts were received by subsequent Jewry, a topic I have not had space to discuss at length in this study. I will merely briefly mention that to his first commentators in the 14th century he represented a bridge between rationalism and mysticism, to the 19th century reformers he was a pioneer of Biblical criticism and was dismissed by the orthodox for that very reason. Today, the interest in Ibn Ezra seems to have come full circle, and he is again studied as a “curious amalgam of astrologer and mystic, spiced with the dash of maimonidean rationalism which in many ways he anticipated”. (Lancaster 2003, 34-35.)

3.2 Religion, astronomy and astrology in Ibn Ezra's time and thought

3.2.1 The intellectual climate of medieval Spain

There are many ways in which Ibn Ezra's thought could be systematized and characterized. Most often this has been done with reference to the theological implications of his thinking (Rosin 1898-9; Friedländer 1877) or neoplatonic elements (Greive 1973; Sirat 1985, 104-112). Because we are here concerned with a text of a technical character, these approaches do not seem relevant. I therefore have chosen a different principle of organization. I have looked for instances of three specific relationships present in his thought: those between astronomy, astrology and Judaism. These three categories represent religion on the one hand and two different types of science, both of which were extremely central to Ibn Ezra's beliefs. The use of these categories helps us to fathom the different relationships between religious and scientific thought in the mind of our author. First, however, some preliminary remarks on the special intellectual climate of medieval Spain are in order.

Since Ibn Ezra was a man of around fifty when he left Spain, we can assume that the major building blocks of his world-view were acquired there. By the 12th century, Spain had acquired a great intellectual tradition which would have greatly influenced Ibn Ezra in his youth, both through straight-forward education and through automatic acculturation. The

Arabic al-Andalus had been a multicultural center of intellectual activity since the 9th century. Ever since Islam had begun to spread in the 7th century, it had come to possess the fruits of an enormous amount of scientific and philosophical learning developed in Greece, Persia and India. For several centuries this knowledge was processed in the great academies of Baghdad and other major Islamic centers, and developed further by many outstanding Muslim figures of the history of philosophy and science. In al-Andalus, astronomy and astrology were particularly favored, and several astronomical discoveries and instruments are of Andalusian origin (Samsó 2003, 956). Also astronomical tables were significantly improved here by the development of the so called *Toledan tables*. Astronomical tables were crucial for both astronomical calculation and astrological interpretation. The arrival in Ibn Ezra's time of the religiously intolerant Berbers did not, curiously enough, inhibit scientific research, although other secular literature seriously declined (Vernet 2003, 945).

Among the educated elite a kind of religious relativism was prevalent, in part certainly inspired by neoplatonic and *sufi* thinking. Educated people in general believed in what was seen as the fundamental harmony between scientific and religious truth, and the Jews were no exception. This is clearly illustrated by the statements of 11th century Jewish official *Bahya Ibn Paquda*. In Ibn Paquda's moral philosophy, the harmony of science and religion is a commonplace, not presented as a new idea. He attacks astrology for its determinism and criticizes scientists for learning only for the sake of an economically secure future in the service of kings. Ibn Paquda's moral censure is instructive for us in that it shows that strongly connected to this relativism was the study and practice of astrology, and also that there was wealth and prestige to be gained by a scientific or astrological career. (Langermann 1999, 42-43.)

Another example of the high esteem in which science was held in Andalusia was the introduction of scientific themes into liturgical poetry, and we hear respected poets like *Moses Ibn Ezra*¹³ (ca 1055- ca 1140) criticizing his fellow poets for the excessive use of scientific imagery. (Langermann 1999, 50). Perhaps the most famous, and certainly the most often cited objection to the widespread relativism of Andalusian Jewish intelligentsia came from *Yehuda Halevi* (ca 1075-1141), Abraham Ibn Ezra's close friend. Halevi's *Cuzari* fiercely opposed the neo-pythagorean, neo-platonic and *sufi* doctrine of the basic equivalence of all monotheistic religions, which Halevi saw as eroding the Jewish faith. In

¹³ No relation to Abraham Ibn Ezra.

textbooks on medieval Jewish thought, the two friends Abraham Ibn Ezra and Yehuda Halevi are often presented as representatives of the controversy between universalism and particularism, Halevi being the quintessential particularist of his time. The relativist or universalist philosophy, which ultimately originated in Hellenism, was very much furthered by a wide acceptance of astrology, which Halevi also strongly opposed. Langermann goes so far as to say that 12th century Spanish Jews were confronted with a type of philosophy in which astrology was one of the central ways of formulating natural explanations (Langermann 1993, 74).

It is important to bear in mind that there was no monolithic “science” in the Middle Ages. The term is necessarily an abstraction that represents the multiplicity of scholars who pursued a plurality of methods in a number of different fields. Furthermore, scholars who worked on scientific matters and scholars who researched religious issues were not divided into rigidly separate disciplines, as is usually the case today. All medieval scholars worked under the assumption that religious beliefs had a bearing on scientific beliefs and vice versa. (Lindberg 2002, 58.) Scholars also assumed that the topics that they wrote about were of universal interest and relevance, even though they may have written for specific audiences (Langermann 1999, 2).

Scientists were generally employed by the courts, either royal or local, of which some were clearly more favorably inclined toward science than were others. Science was not primarily imparted through formal institutions, but often via personal contacts. Nevertheless there were also some institutions with a scientific curriculum, like the famous *House of Wisdom* in Baghdad and *House of Knowledge* in Fatimid Cairo (Dhanani 2002, 78). Al-Andalus followed behind these great centers in intellectual development up until the 11th century, when *Ibn al-Zarqali* (mentioned by Ibn Ezra in *Sefer ha-Olam* and elsewhere), turned Al-Andalus into the forerunner in astronomy (Samsó 2003, 968-9). We can thus understand why Ibn Ezra was so proud of his Spanish scientific heritage.

3.2.2 Religion and astronomy

The relationship between revealed and natural knowledge was one of the most pursued issues of the learned Middle Ages. This is equally true of Islam and Judaism as it is of medieval Christianity. In some cases, conflicts were inevitable, but mostly they involved those claims of Greek metaphysics that were incompatible with religion. In sharp contrast to most medieval thinkers on science and religion, Ibn Ezra was not at all interested in metaphysics. Nowhere in his writings does he attempt to describe the attributes of the Godhead or speculate about ontology or transcendence. For Ibn Ezra, the doctrine of the soul was the only relevant metaphysical subject (Langermann 2006, 15). In section 3.2.4, I will explain how this doctrine was inextricably connected to astrology.

Among the exact sciences, astronomy held a special place for medieval thinkers. Because the objects of astronomy were intangible, luminous and placed in the heavens, studying the stars was still seen as reaching toward the divine. But this also produced problems. Too much or too intent a star-gazing was believed to lead to idolatry, as it was well known that the Babylonians had worshipped the stars and the planets. Astronomy developed quite early into a mathematically advanced science. The incontrovertible nature of mathematics made its results very compelling, and this also created challenges for religious thought. The cosmological challenges that astronomy presented to theology would become more pressing toward the late Middle Ages and culminated in the controversies of the Copernican system four hundred years after Ibn Ezra's time. (Grant 2004.)

But while astronomy and religion interacted in cosmology, there was another connection between astronomy and religion which was much more essential for religious life than any cosmological speculation could ever be: the calendar. Each of the monotheistic religions had their scripturally based religious calendar which specified appointed times for diverse festivals, fasts and other observances. Observing these rituals at their correct times was essential for salvation and for a good earthly life. The questions that astronomy could answer for the religious calendar were of a fundamental nature: what exactly is a day, a month or a year? How do we determine precisely the beginning of the year? When exactly does the Sabbath begin and end? All three religions had their traditions (Talmudic, Hadithic, Patristic) on how to resolve these problems, and they all used astronomy to different degrees at different times to complement those traditions.

Islam had opted for a lunar calendar, that is, a calendar which follows the revolutions of

the moon, creating equal months but letting the seasons fall on different times every year. The Christian calendar followed the sun-induced seasons but made unequal months. The Jewish calendar was luni-solar, which meant that it incorporated both the movements of the sun and the moon in its system, calling for an elaborate system of leap-years to equalize the two. Within Judaism, there was a long-standing controversy regarding the correct calendar, and this controversy was related to the Karaites, a Jewish sect which held that only the Bible and not the rabbinic canon was divinely inspired and therefore authoritative. The Karaites also held that the original calendar of the ancient Israelites was solar like that of the Christians. (Baron 1958, 194-196.) We will see traces of this controversy in Sefer ha-Olam.

Ibn Ezra thought that knowledge of the sciences was indispensable for a correct interpretation of Scripture. Thus he opens his *Yesod Mora* with these words:

“I begin by saying that aside from man's supernal rational soul, a human being has no preeminence over a beast. The soul [...] was placed in the body to be shown the Lord's work, to study the works of her master, and to observe His commandments. [...] Now there are many sorts of knowledge, each one of which is helpful. All of wisdom's categories are rungs in the ladder that leads to True Wisdom. [...] Now one who possesses knowledge of the Massorah¹⁴ but has not studied any other wisdom is like a camel that carries a load of silk. It is of no use to the silk and the silk is of no use to it.” (Yesod Mora 1995, 7.)

Therefore, knowledge of both a religious and a scientific kind were necessary for proper religious life. In his Biblical commentaries, Ibn Ezra applies astronomy to many calendaric issues, prominently to the specification of the new moon (C. Ex 12:2), which is central to the Hebrew calendar. But Ibn Ezra nonetheless held that tradition is also needed for those issues that astronomy and the Biblical text cannot resolve. There is, for example, no astronomically obvious point to begin the year. There is also no Biblical verse specifying from what latitude the observations concerning the new moon should be made. Several such problems lead Ibn Ezra to conclude that we need Talmudic tradition to tell us how to interpret these things (Yesod Mora 1995, 14; C. Ex 25:9). In *Sefer ha-Olam*, the question of the length and beginning of the solar year will open up the discussion of the complementary roles of science and tradition in forming religious knowledge of this type.

¹⁴ The "Massorah" is a reference to the so called *masoretic text*, that is, the fully vocalized Hebrew text of the Tanakh (the Old Testament).

Its calendaric usefulness contributed to a near-total acceptance of astronomy as a science. Whatever opposition there was in Jewish quarters was not so much due to its contents as to the fact that secular study diminished the time spent studying the Torah (Langermann 1999, 5). The Jewish attitude toward science in general was slightly marred by their traditional opposition to all things Hellenistic, which was not the case with the Muslims (Langermann 1999, 53). On the other hand, some peculiarities in the history of Judaism have been particularly beneficial for science. For example, the medieval Jews who first set out to formulate a philosophy of Judaism were fluent in the exact sciences and not only in philosophy (Langermann 1999, 41). But if the relationship with astronomy was based on necessity and practicality, the relationship between religion and astrology was much more tense. First however, we must deal with the distinction between astronomy and astrology.

3.2.3 Astrology and Astronomy

Astrology is a practice based on the conviction that the sky is a kind of mirror of conditions on earth (Campion 2006, 1). One can thus “read” about terrestrial events in the motions of the heavenly bodies. But not all belief in the influence of stars and planets should be considered astrology. David Pingree has pointed out that there are important differences between ancient Babylonian stellar omens and astrology. In Babylonia, the planets were believed to be the physical manifestations of the gods, and their motions spelled out messages by which humankind could interpret the will of the gods. If that will was detrimental to humanity, appropriate rituals could be performed to placate the divinities. None of this holds for astrology. (Pingree 1994, 22.) The significant thing about astrology is that not only does the celestial phenomenon predict a coming event, but the phenomenon itself is also mathematically predictable (Lehoux 2004, 241). It was the Greeks who developed astrology into a distinct tradition and formalized its concepts. In a time when Stoicism was dominant, astrology came to be hugely popular and widespread. This does not mean that it became universally accepted, but instead one can say that astrology, despite its great popularity especially in the Roman Empire and the medieval period, always remained a controversial practice. (Tester 1987, Campion 2008.)

Astronomy, on the other hand, is the mathematical and observational study of the stars, including the mapping of the starry sky and the making of geometrical and physical models to explain the dynamics of planetary movement. It is a common misconception that medieval scholars made no distinction between astronomy and astrology. This misunderstanding is based on the fact that they often did not distinguish between the two words: after all, *astronomia* and *astrologia* both mean the same thing: knowledge of the stars. Jim Tester, in the preface to his *A History of Western Astrology* (1987) criticizes classic works like Thorndike's *History of Magic and Experimental Science* (1923) where astrology is seen everywhere in medieval sources. Not all texts, Tester argues, that contain descriptions of the zodiac or use the word *astrologia*, are actually works of astrology. In the Middle Ages, works of the most rigorous astronomical calculations contained references to zodiacal constellations and planetary properties. (Tester 1987, vii-viii). But there was still a clear understanding that there were two different areas of knowledge. We find that Claudius Ptolemy, the 2nd century Hellenistic astrologer-astronomer, who throughout the medieval period was considered the greatest authority on both topics, wrote in the introduction to his *Tetrabiblos*, a book on astrology:

"Of the means of prediction through astronomy, O Syrus, two are the most important and valid. One, which is first both in order and in effectiveness, is that whereby we apprehend the aspects of the movements of sun, moon and stars in relation to each other and to the earth, as they occur from time to time; the second is that in which by means of these aspects themselves we investigate the changes which they bring about in that which they surround." (Ptolemy 1940, 3.)

The knowledge of the stars, which Ptolemy called “astronomy”, was thus a field which was divided into two branches. The first was what we call astronomy, and the second was what we call astrology. Ptolemy went on to explain that the first, astronomy, is a self-sufficient science, desirable in itself, whereas the second, astrology, is less self-sufficient, and the knowledge that it yields is not as certain or as reliable as that of the first. (Ptolemy 1940, 3-4.) In *Sefer ha-Te'amim*, Ibn Ezra made a similar point to that of Ptolemy. Ibn Ezra explained that regarding the planets and their dimensions and orbits and the distances between them we have “complete and conclusive proofs” (*re'ayot gemurot we-shelamot*). In contrast, about the judgments of the zodiacal signs we have no conclusive proofs but only “analogies and experiences” (*demiyonot we-nissayonot*) (Sefer ha-Te'amim 2007,

185). Sela has shown that Ibn Ezra consistently uses the phrase “judgments of the zodiacal signs” (*mishpetei ha-mazalot*) to denote astrology (Sela 2003, 201).

However, Ptolemy still maintained that one should not by reason of its inconclusive character abandon the investigation of astrology, “when it is so evident that most events of a general nature draw their causes from the enveloping heavens” (Ptolemy 1940, 4). This was to be a common attitude toward astrology for centuries: that it was a more or less valid applied science, but that it was methodologically inferior to astronomy. Like Ptolemy, few doubted that the stars had some influence on terrestrial events, as mentioned above.

The perceived methodological inferiority of astrology was based on Aristotelian notions: Aristotle had explained that knowledge which was attained by *reason* was superior to knowledge which was attained through *experience* (*Metaphysics* 1 A 980a25). These concepts should not be equated with modern notions of theoretical and empirical evidence. Astronomy, for example, was viewed as based on reason, despite its obvious observational basis. Astrology was considered an art based on experience, but this does definitely not mean controlled experiment. The “reason” of astronomy was manifested in its mathematical nature, and the “experience” of astrology was the accumulated astrological traditions. Abraham bar Ḥiyya had made a similar distinction slightly before Ibn Ezra. Bar Ḥiyya called astrology an art (*melakha*) and astronomy a true science (*hokhmah*) (Langermann 1999, 14). It is thus clear that while the relationship between astronomy and astrology was perceived in a way that differs from ours, and although there was no terminological clarity in this issue, the conceptual basis for a distinction between the two areas existed. Meanwhile, a clear understanding of the differences between theory and observation was still lacking in this period (Saliba 1994, 77).

Most astronomers in Muslim countries until the 11th century were employed as astrologers, very often by political patrons. From the 11th century onwards, some astronomers found employment also in the mosque as religious time-keepers, as we have seen. (Saliba 1994, 57.) It is undeniable that the interest in astrology very much furthered and fueled the study of astronomy upon which it rested. We know that *al-Biruni* (973-1048), one of the great medieval Muslim astronomers, took advantage of a king's interest in astrology to advance what al-Biruni thought was real science; astronomy (Nasr 1976, 127). One could thus be a practicing astrologer without believing in its tenets.

This was not the case with Ibn Ezra however, from whom we have ample evidence of his

deep commitment to astrology. There were in the Middle Ages definite attempts to make astrology more rigorous as a science (Saliba 1994, 72), and it is in this light that we must see Ibn Ezra's astrological works. In *Sefer ha-Olam* we see that he recurrently criticizes astrological practice that works with only tables of mean motions, and that he strongly urges the student of astrology to learn how to make periodic observances to correct the tables. Also in *Sefer ha-Te'amim* he makes this point repeatedly. For instance, Ibn Ezra criticizes the Indian astrological tradition that treats the lunar nodes as if they were celestial bodies, when astronomically speaking they are only points of intersection between two orbits (*Sefer ha-Te'amim* 2007, 57, 235). He also argues that precession must be accounted for in astrological practice (*Sefer ha-Te'amim* 2007, 47), as should also leap-years (*Sefer ha-Te'amim* 2007, 251). Thus, as I have already argued, for Ibn Ezra astrology was definitely a science, if not quite as precise a science as astronomy was. He firmly believed that astrology could and should be perfected by means of continuous astronomical observation and calculation.

3.2.4 Astrology and religion

The seeds of the dialogue between Judaism and astrology is observable already in the Biblical text. Belief in astral influences were current in Babylonia and in Egypt, and the ancient Jews did not live isolated from these general currents. The Biblical verse that reads that the sun and the moon were created as "signs" (Gen 1:14) has often been interpreted in favor of astrology, while many passages, especially in the prophets, condemn the astrological practice of "star-gazers" (*hovrei-shamayim*, Isa 47:13) and "chaldeans" (*kasdim*, Dan 2:2). The apocryphal *Book of Enoch* contains a chapter with clearly astrological content, and the proto-typical mystical text of Judaism, *Sefer Yetsirah*, incorporates elements of astrology in its doctrines. The historian Josephus reports that in his time, approximately around the beginning of our era, the practice of astrology was very common among the Jews, just as it was in the entire Hellenistic world. (cf. Altmann 2007, 616-620.)

The rabbinic canon displays a contradicting view on astrology; on the one hand it is condemned as Greek and pagan, but on the other, some kind of influence by the stars on

human life and history is taken for granted. Most of the authorities whose opinions are recorded in the Talmud are firm believers in astrology, while others deny its efficacy. Perhaps the most famous Talmudic verse on the subject is R. Yohannan's view that "*Israel has no star*" (Talmud Bavli Shab. 156a). This verse was made particularly famous by Ibn Ezra, who elaborated upon it, as we will see in section 4.2. In the early Middle Ages other Jews as well participated in the scientific revolution in Baghdad; names like *Masha'allah* and *Andruzgar ben Zadi Faruk*, both mentioned in *Sefer ha-Olam*, belonged to arabized Jews whose contributions to astrology were undeniable, but their work had no real relation to Judaism. (Altmann 2007, 616-620.)

To counter potential accusations of idolatry, Ibn Ezra distinguished between scholars of the stars (*hakhamim ha-mazalot*) and scholars of the forms (*hachamim ha-tsurot*), where the latter were guilty of a forbidden type of astral practice, one that worships the constellations and tries to magically draw down their influences in order to use their power for magical purposes. The former were simply experts in a perfectly valid branch of science, one that was described in the Bible, as Ibn Ezra continually pointed out in his commentaries. (See Schwartz 2005.) Bar Ḥiyya had already used a similar distinction (Langermann 1999, 12).

In his Biblical commentaries, Ibn Ezra often interpreted scriptural verses as being historical references to astrological practice. I will mention only a few examples. Ibn Ezra believed that Pharaoh's obstinacy in the face of the plagues was due to his suspicion that Moses had access to astrological knowledge about coming plagues, and that he used this foreknowledge to make it seem like he had magical command of the elements (C. Ex 8:6). Ibn Ezra gives a similar interpretation of the story of Balaam (C. Num 22:7). Another example is the story of Rachel and Jacob fleeing from Laban. As they fled, according to the story of Genesis, Rachel took with her Laban's *teraphim*, usually interpreted as some kind of idols. According to Ibn Ezra, *teraphim* are astrological instruments, and the reason Rachel and Jacob took them with them as they left was that otherwise Laban, who was an astrologer, could have used them to discern in which direction they had fled (C. Gen 31:19). This type of exegesis is quite common in Ibn Ezra's commentaries, and it does not presuppose any commitment to astrological doctrine, only belief that astrological practice was a historical fact.

There are also other kinds of astrological exegesis, as when he compares nine of the Ten

Commandments to the nine heavenly spheres. *Thou shalt have no other gods* corresponds according to Ibn Ezra to the highest sphere, which propels the whole mechanism of the spheres (the *primum mobile*). *Thou shalt not take the name of the Lord thy God in vain* corresponds to the sphere of the fixed stars, which some have erroneously thought were created in vain. The commandment to observe the Sabbath corresponds to the sphere of Saturn, who ruled over Saturday, the Sabbath day. Since Saturn is a maleficent planet, the evil influence that it exerts is especially potent on this day. This is why Jews are commanded to focus solely on God on Saturdays, so as to alleviate the evil influence of Saturn. *Honor your father and your mother* corresponded to Jupiter, who indicates righteousness, mercy and gratitude, *Thou shalt not murder* corresponds to Mars, the planet of war and aggression, *thou shalt not commit adultery* corresponds to Venus, the planet of love and fornication, *thou shalt not steal* corresponds to the sun, because when it is in conjunction with another planet, it steals away its influence because of its superior power. *Thou shalt not bear false witness* corresponds to the sphere of Mercury, the planet of language and communication, and finally, *thou shalt not covet...* corresponds to the moon's sphere, which indicates desires. (C. Ex 20:12) This, more profoundly astrological exegesis is rarer in Ibn Ezra's commentaries, but the existence of such passages does indicate how complete his commitment to astrological doctrine was. On the other hand, at other times Ibn Ezra declines obvious astrological interpretation, for example he maintains that the reason behind the incident of the golden calf was not that a great conjunction occurred in Taurus, which apparently was an opinion presented by some of his contemporaries (C. Ex 31:18).

According to Langermann, one of the central features of hispano-Jewry in the 12th century was that naturalistic, heavily astrological explanation was applied to religion as well as to secular affairs. This was connected to the relativism that Ibn Ezra grew up accepting as true. Indeed Ibn Ezra is the typical example of this trend. (Langermann 1993, 67.)

Astrology was thus used as background theory for explaining almost anything, whether on earth or in the heavens. The differences between the monotheistic religions were seen as merely results of different astrological and climatological circumstances (Langermann 1999, 44). But at the same time Ibn Ezra also believed that Judaism was the true faith that could help man overcome his stellar fate. I will explain this contradictory position in chapter 4.2.

Despite the numerous surviving texts by religious thinkers that attack astrology, religious authorities did not as a rule oppose it in practice. Instead astrology was gradually

“sanitized” of its pagan roots and deeply incorporated into the religious philosophy of both Islam, Christianity and Judaism (Langermann 1999, 13). One of the reasons that astrology was opposed by religious authorities was its connections with astral magic. Ibn Ezra also displays belief in the reality of such magic. In his Biblical commentaries, he explains several passages as references to ancient astral magical practice. The cherubim on the Ark of the Covenant, for example, were made to receive power from above (C. Ex 25:40). The priestly garments: the ephod and the breastplate, were in Ibn Ezra's opinion astrological instruments with which the high priest gained insight into the astrological fate of the Israelites (C. Ex 28:6). It has been vigorously debated to what extent Ibn Ezra was committed to the opinion that such magical acts were part of ancient Israelite religion (Langermann 1993, 30; Schwartz 2005, 9-26).

As we have seen earlier, religious authorities also opposed astrology for being contrary to the idea of free will. Usually, however, those who condemned astrology accused it of an extreme determinism which is not supported by the evidence. Instead, astrologers usually promoted a very soft version of determinism, allowing for exception from the stellar rule on different grounds (Sela 2003, 195). This is also the case of Ibn Ezra, as we will see shortly.

For Ibn Ezra, the efficacy of astrology was based on the influence of the celestial bodies on the human soul. Like many medieval thinkers, he believed in a tripartite soul, where the lowest form (*nefesh* – the vegetative soul), is common to all living things and constitutes the breath of life, as it were. The middle form (*ruach* – the animal soul) is only present in men and animals and is what makes them animate and capable of pursuing the objects they desire, and the highest form (*neshama* – the intellect) is found only in humans. The celestial bodies affect only the lower two, and men in whom the highest soul is undeveloped, are entirely at their mercy. But one who has cultivated his soul (his highest soul – his *neshama*) with true faith and with intellectual pursuits, can learn to recognize the influence of the stars and thus minimize their effect, or in some cases even escape it (Reshit Hokhmah 1939, 152; Sefer ha-Moladot 2008, 3). The reason why the soul is not subjected to astrological influence while everything else on earth is, is that for Ibn Ezra, the human soul is of the same nature as the divine.

Ibn Ezra's cosmology is also tripartite: earth and everything on it constitute the lowest world. The intermediary world is occupied by the planets and the stars, which mediate

God's will through the mechanisms of astrology in a regular fashion. Above the intermediary world is the highest world of God and the angels (C. Ex 3:15). Further on, he writes:

“Due to the fact that man's soul comes from above the middle world, if it is wise and recognizes the works of God [...] Should there be at the time of birth of such a person an arrangement of the stars indicating that evil will befall this man [...then], God to whom this man cleaves will set the chain of events in such a way that this man is saved from the evil that was destined to befall him.” (C. Ex 6:3).

Man's soul is thus of the same essential nature as the angels; incorporeal spiritual beings, and also originates in their world. A wise man will train this highest part of himself to dominate his person, and by the virtue of this angelic soul, God will allow him to escape his star-decreed fate.

In general, it can be said that Ibn Ezra attempted to make astrology and Judaism compatible without being willing to compromise either one (Rodriguez-Arribas 2005, 149). Astrology was needed to understand many otherwise strange passages in the Bible; many of the reasons behind the actions of Biblical personae were related to ancient astrological or astral magical practices. We have already seen how Ibn Ezra treated Scripture as a source of support for the need for astrological and astronomical knowledge. We must now look at his use of other sources, notably those that are used in *Sefer ha-Olam*.

3.3 Ibn Ezra and the sources of *Sefer ha-Olam*

3.3.1 Abu Ma'shar

In order to fully appreciate the relationship between religion and science in the mind of Abraham Ibn Ezra, we must also consider the way in which he treated his scientific and religious sources. The central sources of his technical texts are considerably different from those of his exegetical works, and for example *Sa'adia Gaon*, who is probably the single

most important source of his exegesis (Langermann 2006, 12), plays little or no role in his astrological works. Instead, the roles of Claudius Ptolemy and Abu Ma'shar are highlighted.

Ibn Ezra mentions many prominent Arabic scientists in *Sefer ha-Olam*, like *al-Kindi*, *al-Sufi*, *al-Battani*, *al-Zarqali* and *Yahya ben Abu Mansur*, and certain Greek thinkers besides Ptolemy, namely *Plato* and *Hipparchus*. Whereas many astrological authorities like *Masha'allah*, *Dorotheus of Sidon*, *Al-Qabisi* and others are mentioned several times, these are not especially revealing about his thoughts on religion and science. For charting the relationship between science and religion in Ibn Ezra's thought, the four sources mentioned in *Sefer ha-Olam* which are most useful for us are Abu Ma'shar, Ptolemy, *Sefer Yetsirah* and Enoch. I will begin with Abu Ma'shar.

Abu Ma'shar Ghafar Ibn Muhammad Ibn Umar al-Balkhi (787-886), known as *Albumasar* in Latin, was the most popular of all medieval Arabic astrologers. He was active in Baghdad during the Abbasid rule and his contribution was primarily in the field of astrology. His principal work is *The Great Introduction to Astrology*, which sets astrology firmly within an aristotelian framework, the first attempt to formulate a philosophical basis for astrological doctrines. (Tester 1987, 159-161.) This text was translated into Latin as early as 1133 (Burnett and Yamamoto 2000, xiv), during Ibn Ezra's lifetime, and while Ptolemy's *Tetrabiblos*, the topic of the next section, was considered the most authoritative text on astrology, Abu Ma'shar was in practice read more widely and quoted more often (Tester 1987, 168).

Another of Abu Ma'shar's works was *The Book of Religions and Dynasties*, also known as *On the Great conjunctions*¹⁵, a treatise on mundane astrology. Its central doctrine states that periods separated by the recurring Saturn-Jupiter conjunctions are associated with earthly historical cycles. The longer the interval between a certain kind of conjunction, the greater and more significant the historical cycle associated with it. (Burnett and Yamamoto 2000.)

¹⁵ The full name of the treatise is as follows: *The book on the sum of the indications of the celestial bodies on terrestrial events occurring in the world of generation and corruption, from their location in the horoscopes of the conjunctive and other beginnings*. The length of the original name explains the use already in medieval times of different shortened forms, of which the above two are the most common. (Burnett and Yamamoto 2000.)

Sefer ha-Olam is in many ways a commentary on Abu Ma'shar's book *On the Great Conjunctions* (Sela 2003, 67). This should not be considered strange, because if one sets out to make a handbook in a certain field of knowledge, and there exists one text more influential and more widely read than any other in this field, one will inevitably end up commenting extensively on this text. Ibn Ezra makes no secret of his debt to Abu Ma'shar. On the contrary, he begins his own mundane astrological text with a sharp critique of Abu Ma'shar (Sefer ha-Olam 1937, 8). Ibn Ezra's treatment of the basics of the Saturn-Jupiter conjunctions is closely parallel to that of the first chapter of part I of *On the Great Conjunctions* (Abu Ma'shar 2000, 3-29). His treatment of astrological transits in Sefer ha-Olam is derived from part VI of Abu Ma'shar's text. The doctrine of the *fardar* is probably also derived from Abu Ma'shar, although Ibn Ezra in this context refers to "Persian astrologers" (Sefer ha-Olam 1937, 11). It is unlikely that Ibn Ezra had recourse to any Pahlavi texts himself, but it was known that Abu Ma'shar had been greatly influenced by Persian astrology. Tester argues that the doctrine of the *fardar* was actually Arabic in origin, not Persian (Tester 1987, 165; see also Pingree 1968, 58). Since Abu Ma'shar and Ibn Ezra both claim a Persian origin for this doctrine, it seems evident that Ibn Ezra has adopted this passage, error and all, from Abu Ma'shar. Several other passages are derived from Abu Ma'shar, as will be seen in the translation notes.

Despite the obvious debts to Abu Ma'shar's *On the Great Conjunctions*, there is an interesting dissimilarity: Abu Ma'shar deals in his book extensively with Islamic history from an astrological point of view (Abu Ma'shar 2000), which Ibn Ezra does not. One might assume that this would have been the perfect opportunity for Ibn Ezra to present his opinions on the astrological elements of Jewish history. We have seen that in his Biblical commentaries, he avidly offers his views on the matter, yet in Sefer ha-Olam he does not even mention the subject.

While Ibn Ezra refers explicitly to Abu Ma'shar relatively few times in Sefer ha-Olam, at least compared to his references to Ptolemy, it is clear that Abu Ma'shar is nevertheless its most central source. Many passages that are void of reference are ultimately derived from Abu Ma'shar, something Ibn Ezra does quite frequently with Abu Ma'shar in all his technical texts (Sela 2003, 302). It seems that Ptolemy was more in accord with Ibn Ezra's scientific ideal of astronomical astrology, and whenever he has a chance to refer to Ptolemy by name, he does so. Abu Ma'shar on the contrary gets much criticism, but is still responsible for the bulk of the text's contents. While still writing Sefer ha-Te'amim earlier

that same year in Béziers, Ibn Ezra referred to his upcoming treatise of mundane astrology by the name of *Sefer ha-Mahbarot* (the Book of Conjunctions), which reveals what was intended as Sefer ha-Olam's chief doctrine: the conjunctions of Saturn and Jupiter which were the central doctrine of Abu Ma'shar's book (Sela 2003, 67).

3.3.2 Claudius Ptolemy

During the Middle Ages, the most revered classical authority on astrology was the 2nd century Alexandrian *Claudius Ptolemy*. Ptolemy is best known for three works: the *Almagest* on astronomy, the *Tetrabiblos* on astrology and the *Geography*. All three works were grand syntheses of Greek knowledge in their respective fields, and all three were considered ultimate authorities throughout most of the Middle Ages. Ibn Ezra was familiar with all three texts in their Arabic translations, and in his scientific texts he refers to them all. There was also a magical-astrological text called *Centiloquium*, which circulated in the medieval period which was attributed to Ptolemy, but which is now known not to have been his writing. Ibn Ezra refers to this text also, convinced as was everyone in his time that he was referring to Ptolemy (Sela 2003, 321).

Ptolemy held a special place in Ibn Ezra's mind. He was the only scientific authority, even the only non-Jewish authority, that he referred to by name in his Biblical commentaries. In Ibn Ezra's scientific texts Ptolemy is also by far the most commonly cited and mentioned authority and in astrology Ibn Ezra adopted many of Ptolemy's basic assumptions. An important example is the view expressed in *Tetrabiblos* that general (mundane) decrees override individual horoscopes, (Ptolemy 1940, 119; Sefer ha-Moladot 2008, 1). In some of Ibn Ezra's texts a clear bias in favor of Ptolemy is discernible (Sela 2003, 243). The mundane astrological doctrines in Sefer ha-Olam that Ibn Ezra borrowed from *Tetrabiblos* are the ones dealing with the full and new moons and the solar and lunar eclipses. According to this doctrine, the “new moon of the year” is the new moon preceding the vernal equinox, and it is the best time to make astrological predictions of a general nature (Sefer ha-Olam 1937, 10; Ptolemy 1940, 161-163).

Ibn Ezra concedes that some of Ptolemy's works are outdated, like his astronomical tables,

which had been supplanted by the much more accurate Arabic *zijes*. But he goes on to defend Ptolemy on the grounds that the height of the sun is difficult to measure as it cannot be directly observed, and that the errors were really the fault of Ptolemy's predecessor, Hipparchus (Sefer ha-Olam 1937, 10).

It seems that while he was compelled to criticize Ptolemy for some faulty data, Ibn Ezra was eager to agree with Ptolemy and introduce as much of his views as possible. According to Sela, there is a very strange and surprising reason for this. It seems that Ibn Ezra had decided that Ptolemy the astronomer-astrologer was the same person as Ptolemy the king, the third century B.C Greek ruler of Egypt. This connection is related to the Talmudic tradition that King Ptolemy commissioned the translation of the Hebrew Bible into Greek¹⁶. The Talmud relates that the seventy-two elders commissioned with this task committed a set of deliberate errors in order to keep certain secrets from the Greek king. According to Sela's view, Ibn Ezra believed that Ptolemy ordered the translation of the Hebrew Bible in order to gain access to secret scientific knowledge. The two Ptolemies were in reality two very different persons: *King Ptolemy II Philadelphus* reigned in Alexandria in the 3rd century B.C., whereas Claudius Ptolemy the scientist worked in Alexandria in Roman times, more than three hundred years later. But in Ibn Ezra's mind, they were the same, and this "Ptolemy the scientist-king" in fact committed an act of scientific espionage as he commanded the translation of the Hebrew Bible. The title of "king" in association with Ptolemy is also found in some Arabic sources, for example in Abu Ma'shar's *Great Introduction to Astrology*, which suggests that this confusion was widespread in Spain in Ibn Ezra's time. (Sela 2003, 296-305.)

There was a notion, current among Jewish medieval intellectuals, which Sela calls the "theft of science from the Jews by the Greeks", which stated that science was originally a Hebrew invention, one that had been forsaken by the Jews in their sinfulness, and subsequently snatched away by the Greeks. Ibn Ezra shared this curious idea, as did also at least his contemporaries Abraham Bar Hiyya and Judah Halevi (Sela, 2003, 306, 310). This notion justified the practice of science, because it allowed them to believe that they were really only restoring the scientific knowledge that had always been the doctrinal property of the Jews (Sela 2003, 305-313).

Instead of bitterness towards Ptolemy as a cultural thief, stealing away all the glory for

¹⁶ Resulting in the *Septuagint*.

these scientific wisdoms, Ibn Ezra greatly admired him. This is because the science that Ptolemy the scientist put forward was in his mind ultimately that which Ptolemy the king had found in the Hebrew Scriptures. Thus agreeing with Ptolemy was almost the equivalent of agreeing with the Bible. While this conception is not immediately present in the text of Olam, it does help us to understand the strong inclination to favor Ptolemy in all matters. (ibid.)

3.3.3 Sefer Yetsirah

In Sefer ha-Olam, Ibn Ezra cites the ancient Jewish mystical tract *Sefer Yetsirah* (the Book of Creation). The dating of this text is uncertain, but current guesses range from 300-600 C.E. The text contains a mystical account of creation. It is the principal source of a type of letter and number symbolism which came to be a distinguishing mark of later mysticism, and incorporates extensive permutations of the divine Name YHWH (Martola 1998, 127-128), a frequent preoccupation of Ibn Ezra's as well. The text also includes allusions to the planets and stars as having a role in the work of creation. (Scholem 1946, 76.) According to Gershom Scholem, Sefer Yetsirah represents the earliest extant speculative text written in the Hebrew language. This is crucial for our purposes, because although it cannot be called a scientific text, it does attempt a more theoretical approach to cosmology and cosmogony than earlier mystical texts, which simply described apocalyptic and prophetic visions (Scholem 1946, 75). It is in this theoretical capacity that Sefer Yetsirah became important for Ibn Ezra.

As we saw in the previous section, Ibn Ezra had curious opinions about the sources of Ptolemy's scientific knowledge. Ibn Ezra also believed that Sefer Yetsirah dated back to the 2nd century, the time of Ptolemy. For Ibn Ezra, the existence of an ancient Jewish scientific text contemporaneous with Ptolemy apparently proved that the Jews had possessed advanced scientific knowledge already in antiquity. Therefore this text was one of his favourite sources. Sefer Yetsirah also had the advantage that it was a Jewish text which supported the use of number and letter symbolism as a scheme for understanding the interconnectedness of the universe. (Langermann 2006, 3.) This scheme could easily be integrated with astrology, which to a great degree involved arithmetical and geometrical

relations. Some later medieval writers referred to a commentary on Sefer Yetsirah by Ibn Ezra, but no such commentary has been found, and it is uncertain whether it indeed existed (ibid.). On the other hand, Ibn Ezra's principal exegetical source, Sa'adia Gaon, had written a commentary on Sefer Yetsirah already in the early 10th century.

In Sefer ha-Olam, Ibn Ezra cites Sefer Yetsirah in a defence for the astrological doctrine of the *fardar*. The *fardar* was an astrological period of 75 years which was to indicate a certain recurring cycle of development in earthly affairs. Ibn Ezra presents the hypothetical critique against this doctrine that if the world followed a succession of *fardars*, then every 75 years should be exactly the same, which they obviously are not. Ibn Ezra counters this argument by saying that the heavens would not look identical during two different 75-year periods, due to the various aspects of the seven planets and to the slow shift of the fixed stars, known as precession. And here he cites Sefer Yetsirah on an exponential formula which is meant to prove that, given the number of variables in the heavens, the number of possible combinations becomes vast beyond reckoning. This in turn accounts for the great variety of phenomena in the world (Sefer ha-Olam 1937, 12). At the same time, he also managed to insert the idea that this description of the astrological mechanism was what the revered authors of the Sefer Yetsirah had had in mind.

3.3.4 The three Enochs

Ibn Ezra several times refers to a source he calls Enoch. This Enoch is an interesting case. In Sefer ha-Olam, Ibn Ezra refers to him by three different epithets: Enoch the First, Enoch the Ancient and Enoch the Egyptian (Sefer ha-Olam 1937, 14, 17). There is an intriguing story behind these epithets.

Enoch is a Biblical figure, an early forefather of Noah, who is said to have "walked with God, and he was not, for God took him" (Gen 5:22-24). This was often interpreted as Enoch achieving mystical knowledge and escaping natural death. There is also an apocryphal book bearing his name, the Book of Enoch, which includes much material of an

astronomical and astrological nature. Apparently, this was “Enoch the Ancient” (Sefer ha-Olam 1937, 14) By Ibn Ezra's time, however, Enoch had become commonly associated with the Egyptian *Hermes*, mythical author of the so-called *Hermetic literature*, a corpus of Hellenistic Egyptian liturgical-mystical texts. For unknown reasons these texts give Hermes the epithet "thrice great" (Mead 1906, 116) and Ibn Ezra apparently applied this idea to Enoch.

Ibn Ezra apparently believed that Enoch, who had never died, had appeared as a scientific world-teacher in three separate historical epochs: the first time before the flood, mentioned in Genesis. This was “Enoch the First” (Sela 2003, 184-185), the second time in Antiquity producing the apocryphal book, and the third time as Enoch the Egyptian (Sefer ha-Olam 1937, 14) to produce the Hermetic literature. As a scientific source, however, Ibn Ezra treated Enoch as any other. Although in general, he agreed with Enoch's opinions on astrology, he did not shrink from criticizing this authority for not providing any reasons or explanations for his doctrines (Sefer ha-Te'amim 2007, 75). There seems to be no doubt in Ibn Ezra's mind that this Enoch was an actual scientist, and he enjoys no special status as a source for the sake of his supernatural origins.

3.4 Religion and science in Ibn Ezra's life, thought and sources

The relationship between religion and science played a major role in Ibn Ezra's life, in his thought and his attitude toward his sources. But these relationships are by no means simple or unambiguous. He grew up in an intellectual milieu where a kind of religious relativism was predominant, and learned to apply exact and occult sciences to all things, even religion as a category of human life. At the same time, he was deeply religious and his Biblical commentaries illustrate his need to harmonize his faith in the superiority of the truth of Judaism and his professional tendency toward relativism.

We do not know for certain why he left his native country, but it may have been partly because of a change in the attitude of Muslim authorities toward one of the sciences he was

trained in, as well as toward the religious minority he belonged to. What had been a highly liberal society in regard to the pursuit of different forms of knowledge was now ruled by an increasingly conservative traditionalist interpretation of Islam. Disappointed with this development, he left the Arabic sphere altogether and headed for Christian areas. In Rome, the heart of Catholic Christianity, he found that the Jews were also conservative and traditionalist, and did not welcome science in Biblical interpretation and religious life, whether that science was exact or occult. This must have frustrated Ibn Ezra, for whom a sharp distinction between sacred and secular genres was irrelevant (Sela 2003, 12).

In Béziers he found Jews who were more sympathetic to his cause, and it is here that he was most productive. But in northern France he found that one of the exegetes, the tosafist Rashbam, was departing too far from rabbinic tradition in their interpretation of Scripture, and the last text he wrote in England is a text which affirms the need for tradition alongside the scientific interpretation (Lancaster 2003, 20). In relation to the Biblical text, astronomy and secular sciences in general were indispensable because there were so many Biblical passages which could only be understood in their light, but he defended rabbinic tradition as the authority on religious law, *halakha*, because science could not help man to know how he should behave.

Since the relationship between the sacred and the secular, between religious and scientific knowledge and his conviction of the need for both was so central to his outlook, it is no surprise that his texts are suffused with this topic, both directly and indirectly. It was not only exact science and Judaism that he wanted to make compatible with each other, it was also astrology. He was keenly aware that astrology was something different from astronomy, and he wrote extensively on the compatibility of astrology with Jewish faith and on the necessity to update astrological interpretation with the latest astronomical advancements. He was intent on showing that astrology could be more than an occult science associated with magic, and given that it was based on precise data, it could be a reasonably exact science.

Ibn Ezra's choice of sources also reveals a complex picture of religion and science. In keeping with the liberal philosophical tradition of Al-Andalus, he did not discriminate between Muslim, Greek and Jewish sources, but treated them all equally regardless of the religious affiliations of their authors. He showed no favoritism to such scholars as Masha'allah, Andruzgar or Bar Ḥiyya for their Jewish descent, because in a technical

environment, religious affiliation simply did not play any role. The Muslim Abu Ma'shar was his principal source for *Sefer ha-Olam*, and although he is sharply criticized, it is not for religious but for a purely methodological reason; Abu Ma'shar relied on inaccurate data.

But this does not mean that his attitude toward his sources was neutral and dispassionate. It is true that he does not discriminate between them on the grounds of religious affiliation, but he does instead favor those that support his own peculiar vision of the origin of the sciences. Ptolemy, a pagan source, is favored because of the imagined connections he had with the ancient Jewish sages, a topic we will encounter again in section 4.3. *Sefer Yetsirah* was promoted for similar reasons; as proof of the early scientific distinction of Jewish authorities. Somehow his attitude to Enoch is most surprising of all. Despite his belief that Enoch was something of a supernatural character who never died, Ibn Ezra treats him as he would any other source, and does not shrink from criticizing him when he does not agree with him.

Put in terms of the four types of interaction between religion and science presented in section 2.3.4, the life, thought and sources of Ibn Ezra form a complex picture. Educated in an intellectual milieu that presupposed Polkinghorne's third category *dialogue*, Ibn Ezra encountered *conflict* in two different forms, first by the Almohad Muslims, who felt that astrology specifically was in conflict with their interpretation of Islam. They felt the same way about other religions also. Ibn Ezra also experienced the impact of the conflict view of science and religion among his coreligionists in Rome, who were conservative and did not feel that their Talmudic learning needed to be supplemented with the sciences. We can therefore conclude that the attitude of conflict was not the characteristic of any one religious tradition, whereby we can reject ethnocentrism.

The Almohads who rejected astrology, meanwhile favored astronomy, and established the institution of time-keeper of the mosque, allowing astronomers to be employed by the mosque instead of political patrons. This shows the existence of a plurality of sciences involved. We therefore also conclude that the conflict could be postulated against one form of science and backing another, which vindicates the complexity thesis above the conflict thesis and exemplifies the third type of interaction in my typology: the *triangle-situation*.

In Ibn Ezra's thought, a major concern was the application of the fourth type of interaction, *integration*, to science and religion. It is to be noted that this was integration without assimilation, because neither science nor Judaism was to be subjugated into the union. This at least was Ibn Ezra's aim, and whether he succeeded in this was (and is) actively debated by posterity.

In his treatment of sources, Ibn Ezra seemed to apply the principle of *independence* insofar as only technical factors were relevant for his approval or disapproval of his sources, like the case of Abu Ma'shar clearly shows. But beneath the surface there are other considerations. The Greek scholar Ptolemy could be highly praised not only for his scientific supremacy, but also because Ibn Ezra believed that agreeing with Ptolemy furthered the integration of science and Jewish religion. An example of this tactic will be shown in section 4.3.

4 RELIGIOUS THEMES IN SEFER HA-OLAM

4.1 Three themes with religious background

In the previous chapter, I have described the relationship between religion and science as they are represented in Ibn Ezra's life and thought as well as in his attitude toward his sources. I now intend to deepen this picture by focusing on three particular cases that are found in Sefer ha-Olam. First I want to say a few words about how they have been selected from the total contents of the text.

First of all, the three passages chosen for closer scrutiny are not representative of the text as a whole. In fact, they are chosen for precisely this reason. Most of the passages of the text are discussions of astrological methodology in line with the following: authority x is reported to have written that one can predict certain events from certain celestial

phenomena, and details are provided. Then Ibn Ezra recounts diverging opinions on the matter and in some cases reports which opinion he sides with. (See the whole translation in Appendix 2.) This kind of discourse, as interesting as it may be from the point of view of the history of astrology, does not reveal to us anything about Ibn Ezra's thoughts on science and religion.

Two passages stand out from this general trend, and must therefore have been introduced by Ibn Ezra on other than purely astrological grounds. First, there is a lengthy arithmetical formula for calculating the maximum number of different conjunctions among the seven planets (Sefer ha-Olam 1937, 8). This is strange because the number of conjunctions is not of any astrological significance. Only the place and circumstances in which conjunctions occur are astrologically meaningful data. The second is a long discussion on the length of the solar year (Sefer ha-Olam 1937, 9-10), an important and widely debated scientific issue in Ibn Ezra's time. While its outcome does have some astrological implications, it is wholly astronomical in character and not a topic one would expect to be treated at length in a handbook on mundane astrology.

Before introducing these issues, I will analyze a short list of astrological correspondences for the monotheistic religions (Sefer ha-Olam 1937, 19). Since Sefer ha-Olam is a scientific text insofar as astrology was science to Ibn Ezra, it is religious elements that I have had to look for in the text. Therefore, while this third passage is indeed pertinent to astrology, and most specifically to mundane astrology, it is the only explicit mention of religion in the entire text, and must therefore be analyzed first.

4.2 Ruled by Saturn but saved by God - the astrological status of the Jews

4.2.1 Astrological history

The only explicit reference to religion in Sefer ha-Olam is the very brief mention of astrological correspondences for Christianity, Judaism and Islam toward the end of the text.

Essential for a doctrine on prediction of the future of nations and kingdoms was a system of astrological correspondences for these political, ethnic or religious entities. This entailed correspondences between signs and groups of peoples, so that this sign and its ruling planet could represent the group in the astrological chart. Then the astrological circumstances of the sign or planet indicated future physical circumstances for the nation. A considerable portion of Sefer ha-Olam is devoted to listing such important correspondences.

Astrological correspondences are given for geographical areas like Khurasan (Sefer ha-Olam 1937, 14), political units like Byzantium (ibid.), cities like Cordoba (ibid.), social groups like craftsmen (Sefer ha-Olam 1937, 19) and religious groups like Christians (ibid.). Ibn Ezra reports external sources for all these list except the last one, at the end of the text, where he says, almost as an afterthought:

"I have also tested several times that the sun indicates the Christians and Saturn (indicates) the Jews and Mars (indicates) Kedar¹⁷ and Venus (indicates) the Ishmaelites. And according to its influence at the beginning of the year, so shall you judge." (Sefer ha-Olam 1937, 19.)

In this passage Ibn Ezra explains that in reading the horoscope which was cast at the beginning of each year for the religion whose future one wanted to predict, one should pay attention to the position of that planet which was assigned to the nation in question. For Christendom, this was the sun, for Islam, this was Venus and for Judaism, this was Saturn. Ibn Ezra mentions these correspondences also in connection with the planets in Sefer ha-Te'amim (2007, 69-83). Although in the first version of Sefer ha-Olam, Ibn Ezra only mentions these correspondences this briefly, in his second version of this text, he had somewhat more to say on the subject:

"It has been proven by experience that Leo and the sun are assigned to Christendom and that a conjunction [of Saturn and Jupiter] occurred which ushered in the birth of he whom they deem to be God. Aquarius is the zodiacal sign assigned to Israel. [...] The conjunction of Saturn and Jupiter which ushered in the birth of the prophet of the Muslims occurred, according to their opinion, in the zodiacal sign of Scorpio." (Sefer ha-Olam B, cf. Sela 2003, 378-380.)

¹⁷ "Kedar" is the name of an Arabic tribe. However, Abu Ma'shar writes "Mazdaism" in a passage which is very similar to the above one in Sefer ha-Olam. It is probable, therefore that it means Zoroastrians in this context also, where the three other mentioned entities are religions. (Abu Ma'shar 2000, 45).

As this passage in Sefer ha-Olam B shows, the correspondences are derived from the larger topic of *astrological history*, practiced by Arab astrologers like *Masha'allah* and *Abu Ma'shar*, both of whom were strongly influenced by Vedic and Zoroastrian astrology with their emphasis on recurring cycles of creation and destruction. Both Masha'allah and Abu Ma'shar were also among Ibn Ezra's main sources. This astrological history, presented by Abu Ma'shar (Pingree 1968), is based on the Saturn-Jupiter conjunctions.

The recurrence of the conjunctions of Saturn and Jupiter against interchanging zodiacal signs produced a complex system of periods in which the influence of a certain planet would predominate for the duration of a certain cycle. One of these was the *dawr* of 360 years. Abu Ma'shar had specified the date of the Flood, the previous "destruction" of the world, as Friday 18th February 3101 BC . He had then associated one such 360 year-epoch with the emergence of each historical religion, from the Flood until his own time. The eighth of those periods, from 860-500 BC, was ruled by Saturn and its domicile¹⁸ Aquarius. According to Abu Ma'shar, in this epoch Moses appeared as a leader. (Pingree 1968, 68-69.) Hence, the Jews were considered to be ruled by Saturn, and their zodiacal sign was Aquarius. (Sela 2007, 158.)

4.2.2 The Jews and the exemption from astrological rule

From the above passages in Sefer ha-Olam, it would seem that religion is completely subjected to the classifications of astrological method. Astrological considerations determine the planetary and stellar influence which is connected to each religious group. We saw also that religion is put on a par with other phenomena of human culture such as kingdoms, geographical areas and social classes. As a consequence, Jewish religion was accorded a very similar status to that of its rivals. The rule of different planets made the religions different, but Jews were equally ruled by their constellation as members of other religions were ruled by theirs. If anything, the position of the Jews was the least advantageous because their planetary ruler, Saturn, was the most maleficent of all the planets. According to stock astrological doctrine and admitted by Ibn Ezra, Saturn indicated: "*...destruction and ruin and death, affliction, weeping, grief, complaint and ancient things*" (Reshit Hokhmah 1939, 193). On the other hand, it is plausible that Ibn

¹⁸ See Appendix 1. on basic astrological concepts.

Ezra believed as did Ptolemy, that a maleficent planet was less harmful to the nation which was "familiar" to it (Ptolemy 1940, 189-191), as the Jews were as the people ruled by Saturn's domicile, Aquarius.

But in Ibn Ezra's Biblical commentaries, the Jews were presented as having an extraordinary position which had nothing to do with Saturn. God had made a spectacular exception in Israel's case by making it possible to be saved from the influence of the stars altogether. Thus we see in Ibn Ezra's commentary on Exodus 20:1 that:

"Good or bad befalls every nation according to the arrangement of its star, for this is what God has apportioned them. Now Israel was destined to continue in slavery according to the stars of its constellation. However, because of God's love of the patriarchs, the Lord uses His power to bring forth signs in the lowest world which were not decreed by the powers of the middle world. God removed Israel from the rule of the constellations and made them the people of His very own inheritance. It is because of this that the ancients say "Israel has no star." (C. Ex 20:1.)

Note that in the statement "*for this is what God has apportioned them*", it is implied that the general way in which God carries out his will in the world is by regular astrological influence. It is from this regular machinery that Israel had been exempt. But redemption from the stars was always dependent on the moral stature of the Israelite:

"...'Israel has no constellation' as long as they keep the Torah. If Israel does not keep the Torah, then the star rules them, as has been proven, for any conjunction combined with Aquarius is an evil arrangement. It results in harm befalling Israel. This is admitted by the astrologers. Now the stars were arranged in a conjunction which decreed that Israel should remain in exile in Egypt for many more years. God delivered them because they cried out unto the Lord and turned to Him. What is true for the group is true for the individual." (C. Ex 33:21.)

Thus the regular astrological machinery determining the fate of the nations had dictated that the Jews would remain in bondage. The zodiacal sign associated with the Jews, Aquarius, indicated slavery in Egypt because it ruled over the land of Kush (Egypt) and in society, it ruled all downcast and afflicted people (Reshit Hokhmah 1939, 183-184). Only because they had been morally superior to the other nations had God saved the Jews from that fate, indicating both that God was supremely above the machinery he had created and

that He would overrule it for the benefit of subsequent Jews as well, if they remained morally superior. If they did not, however, they were at the mercy of their ruling constellation, Aquarius.

Ibn Ezra believed that in postulating this clause, he had solved the problem of combining ubiquitous astrological influence with the religiously crucial unique status of Judaism. This clause stipulated meticulous clinging to the commandments as a requisite for exemption from stellar rule. The theologically sensitive question of determinism that had always been a stumbling block between astrology and revealed religion was thus resolved. He had in fact combined the Talmudic dictum “Israel has no star” (*ein mazal le-jisrael*) with a belief in regular astrological influence which was valid everywhere. This inventive solution made it possible for him to refrain from subjecting religion to science or science to religion. Thus in *Sefer ha-Olam*, religion is a thing to be classified and analyzed according to the rules of science (in this case, astrology), but on another level, as evidenced by his Biblical commentaries, religion is also capable of changing those rules if the conditions for such change are suitable.

4.3 When science fails - the problem of the length of the solar year

4.3.1 The solar year and mundane astrology

After having presented the most central mundane astrological doctrine, that of the Saturn-Jupiter conjunctions, Ibn Ezra digresses into a lengthy account of the measurement of the solar year. The reason for this digression is given at the outset: it is an argument against those who claim to be able to determine the astrologically important ascendant¹⁹ of the Saturn-Jupiter conjunction. Ibn Ezra explains that it is impossible to determine the moment of the conjunction with more precision than the date. While the day of the conjunction can be determined, the hour cannot, and since the ascendant changes approximately every two hours, it is thus impossible to predict it. In mundane astrology, the predicted periods are often very long; even hundreds of years, meaning that even very small errors become

¹⁹ The ascendant is the zodiacal sign (or exact degree) which is rising above the eastern horizon at the given moment. See also Appendix 1 on astrological concepts.

major discrepancies over time. (Sefer ha-Olam 1937, 10.) Furthermore, we do not even know the exact length of the solar year, he explains, and no scientist of his time or earlier has been able to produce a satisfactory measurement of the solar year, another reason why the ascendant cannot be utilized in this case. This argument is followed by a long methodological exposition on the difficulties of measuring the sun's apogee with the instruments available in his time, as well as various estimations made by authorities from Antiquity to Ibn Ezra's own time (Sefer ha-Olam 9-10).

Ibn Ezra concludes the discussion of the solar year by returning to the original question: that of making predictions based on the ascendant of the moment of the Saturn-Jupiter conjunction. Confident that he has proven this to be impossible and based on imprecise data, he suggests that one use instead a method from Ptolemy's *Tetrabiblos* based on the new or full moon preceding the beginning of the year. This doctrine teaches that the sign in which the last new or full moon of the year occurs is to be interpreted in a similar manner as the ascendant would have been, that is, as a general sign for the coming year. (Sefer ha-Olam 1937, 10-11; Ptolemy 1940, 161-163.)

The whole discussion thus seems to concern a doctrinal issue within astrology, one where one rule is supplanted by another on the grounds that the data for the first one cannot be determined with sufficient accuracy. There seems to be no connection to religion here, until we realize that Ibn Ezra uses this same argument in a very similar manner in a religious context, one dealing with the religious calendar.

4.3.2 The calendaric controversy

In his commentary on Leviticus, Ibn Ezra presents the same problem of measuring the length of the solar year in connection with the Hebrew calendar (C. Lev 25:9). For medieval people, the religious calendar was much more than a practical way of dividing time. The observance of rites at the correct time was essential for salvation, and the calendar was also symbolically important for the sense of minority identity. The Hebrew calendar with its specified holidays was (and still is, of course) one of the most central features of Jewish religious life. The Hebrew calendar was also a way to distinguish Jewish

practice from that of the lunar calendar of the Muslims and the solar one of the Christians. In the Middle Ages, Jewish calendric questions were widely discussed, and the debate was influenced by the so called *Karaite controversy*. The Karaites were a Jewish sect that denied the authority of the rabbinic canon. They were very influential in the 9th century, and still exerted some influence in Ibn Ezra's time. The Karaites also argued for a wholly solar calendar (Sela 2003, 280), similar to the one that the Christians had adopted from the Romans.

In the commentary on Leviticus, Ibn Ezra argued against the Karaite *Judah ha-Parsy's* opinion that ancient Israel used a solar calendar. As Ibn Ezra contended, Scripture does not say when the year begins nor from which point its length is to be calculated (C. Lev 25:9). In a passage very much reminiscent of the discussion in *Sefer ha-Olam*, Ibn Ezra shows that there is no astronomically self-evident way to calculate the year's length. He also presented the different methods by which the calculation can be done, just as he did in *Sefer ha-Olam*. He concludes that since Scripture does not say which method of measurement to use, and there is also no rational reason to favor any one of them, one must instead rely on Talmudic tradition. As an additional argument for reliance on the sages, he maintains that the method of intercalation employed by the Talmudic sages, resulting in a lunisolar calendar with seven leap years in a 19 year cycle, “is close to the calendar proposed by Ptolemy” (ibid.). This last position is particularly interesting, and I will return to this shortly. (See also Sela 2003, 281.)

We are here confronted with a theological argument in favor of rabbinic intercalation²⁰ offered as a repudiation of the Karaite opinion on the calendar. As a correct calendar is crucial for religious life, Ibn Ezra holds that one should not decide such matters solely on the basis of one's own judgment, which is what the Karaites proposed to do whenever Scripture failed to specify the correct course of action. Observing rites at their proper times was essential for salvation, and should therefore be regulated by rabbinic authority. The Hebrew lunisolar calendar was fixed in Roman times by the Jewish Supreme Court, known as the *Sanhedrin*. Soon after this the Sanhedrin was dispersed by the Romans, but it remained an important symbol of Jewish law and rabbinic authority. (Baron 1958, 194-196.) By equating Ptolemy's opinion with that of the Sanhedrin, Ibn Ezra attempted to prove that ancient Israel had been in possession of scientific knowledge that was comparable to that of the Greeks. As I have explained in section 3.3.2, Ptolemy's views

²⁰ Intercalation is the insertion of an extra unit of time into the calendric year in order to retain the balance between dates and the seasons.

were in Ibn Ezra's mind ultimately the views of the sages who translated the Bible to Greek. His interpretation of Leviticus 25:9 is thus as much an endorsement of the idea of Israelite origins of science as it is a critique of Karaite views.

4.3.3 When science fails, turn to tradition

The issue of the length of the solar year thus features in two very different contexts: in *Sefer ha-Olam*, a scientific treatise, it is presented as a technical problem. In the commentary on Leviticus it is presented as a theological issue. But these two passages have more in common than only the length of the solar year. They are also very similar in the structure of their arguments. Let us review these similarities:

Both arguments differ from the usual ideology of Ibn Ezra in that they both present an essentially negative view of science (Sela 2003, 286). They both present a situation where astronomical calculation, the very epitome of science, has failed. In *Sefer ha-Olam*, this results in the inability to perform astrological prediction according to the normal rules. In Lev 25:9 this means that we can not rely on our own rational ability to calculate the correct time for religious observances. The solutions to these predicaments also resemble one another in both cases: In *Sefer ha-Olam*, the astrologer is to rely on the rules set out by Ptolemy. In Lev 25:9, the inability to solve the question by calculation means that the Jew should rely on tradition and trust the expertise of his forefathers.

In the chapter dealing with Ibn Ezra's special relationship with Ptolemy, I have already explained that for Ibn Ezra, agreeing with Ptolemy was equivalent to agreeing with the Jewish sages who had translated the Hebrew Bible for King Ptolemy the Thief. Thus both arguments have the same ultimate consequence, which is that they strengthen the belief in the scientific adequacy of the Sanhedrin and other rabbinic sages. These passages thus both find their meaning within the ideological notion that science was originally the property of Israel. In both *Sefer ha-Olam* and in the commentary on Lev 25:9, Ibn Ezra makes the point that whether in a scientific or a religious context, if rational inquiry should fail, one

should trust the authority that leads toward the prominent scientific past of the Jewish people.

4.4 Divine symmetry - the 120 conjunctions

4.4.1 A combinatorial puzzle

At the very outset of *Sefer ha-Olam*, preceded only by his attack on Abu Ma'shar for his use of tables of mean motion, Ibn Ezra presents the issue of the 120 conjunctions. Abruptly and without explanation, he informs his readers that the conjunctions of the planets are 120 in number. He then gives a mathematical formula by which this number can be obtained. In short, the question is how many different combinations of two or more planets can occur among seven planets. Every planet can combine in a two-planet conjunction with six other planets. "We multiply this number six with its half and add its half to it, thus 6 multiplied by 3, plus 3, and we get 21, which is the number of possible two-planet conjunctions". He then proceeds to calculate the number of three-, four-, five-, six- and seven-planet conjunctions. (*Sefer ha-Olam* 1937, 8.)

The mathematician Doron Zeilberger has praised the inventive, if slightly elaborate combinatorial scheme here employed by Ibn Ezra (Zeilberger 1998). Sela has shown, however, that the formula Ibn Ezra presents is not his own invention, although in *Sefer ha-Olam* he does not name his source. In a mathematical treatise, *Sefer ha-Mispar*, Ibn Ezra mentions his source to be "arithmetical experts". Sela concludes that one of the reasons why Ibn Ezra so eagerly presented such problems in his texts is to amaze his readers with the beauty of numbers (cf. Sela 2003, 316). As such, it was part and parcel of his larger message of the mysterious interconnectedness of the universe. But there is a deeper way in which this issue succeeds in doing this. Once again we must turn to Ibn Ezra's Biblical commentaries for further information.

4.4.2 The conjunctions and the Name of God

Ibn Ezra presents this same issue of the 120 conjunctions in his long commentary on Exodus 33:21. Here it forms part of a lengthy exposition on the Biblical verse describing how Moses is not allowed to see God's face but only His back, a highly metaphysical subject. Ibn Ezra's exposition starts with a discussion on the numerical value of the name of God.

In Hebrew, as in many semitic languages, each letter of the alphabet has a numerical value as well as a phonetic one. This is common practice in Hebrew, but it has also had a mystical application: the kabbalistic exegetical method known as *gematria*. In the *Sefer Yetsirah*, described above in chapter 3.3.3, the numerical values ascribed to the letters of the alphabet are used to reveal numerical connections between Biblical words. As a particular focus of this method is the revealed Name of God, YHWH (generally vocalized as Yahweh). For hundreds of years, this name has been the object of reverence, taboo and mystical speculation. In many cases, it was believed to confer great creative power on one who pronounces it (Trachtenberg 1939, 90). The numerical value of this name was given as 26, which is simply the sum of the values of each of the four letters of the name.

For a man like Ibn Ezra, who had a deep fascination with numbers, it was natural to indulge in this type of numerology. As Sela has noted, Ibn Ezra addresses the question of the number of conjunctions also in his commentary on Exodus, although with a slightly different emphasis (Sela 2003, 317; C. Ex 33:21). In his commentary on Exodus, Ibn Ezra compares the simple numerical value of the Name of God with the number of conjunctions of five planets, which comprises all the planets except for the luminaries. This is followed by a very similar presentation of the 120 conjunctions of the seven planets as the one seen in *Sefer ha-Olam*. But in his commentary on Exodus Ibn Ezra makes the point that the

number of possible conjunctions of five planets is 26, the same as the numerical value of the Name of God, in the same way that the number 120 is the number of conjunctions of seven planets. Although the number 120 is not directly connected to YHWH, it is numerically equivalent to the value of the first two letters of it (YH). This forms the word *Yah*²¹, which is another name of God. From this there is only one logical step to the number 120, since the numerical value of YH is 15, and the sum of the digits of 1-15 is 120 ($1+2+3+\dots+15 = 120$). (C. Ex 33:21.)

For Ibn Ezra such perceived numerical symmetry was highly significant, and indicative of a deep structural correspondence between numerically equivalent things. He had succeeded in demonstrating that the number of possible planetary conjunctions corresponded to the sum of the values of the two-letter name of God. If the luminaries were excluded, the correspondence was even more spectacular: the number of possible conjunctions of the five non-luminary planets was equal to the number of the sum of the four-letter Name of God, that most holy name, revealed to Moses at Sinai, YHWH. This line of reasoning introduced a structural bridge between the scientific and the religious. (C. Ex 33:21; Sefer ha-Olam 1937, 8; see also Yesod Mora 1995, 166-167; Sela 2003, 313-323.)

In Sefer ha-Olam Ibn Ezra gives no hint that the purely mathematical puzzle of the maximum number of conjunctions among seven planets could have anything to do with religious issues. It is only when we compare the passage to his treatment of the same topic in his other writings that we begin to see what ideological or religious role this issue plays in Ibn Ezra's mind. In Ibn Ezra's world-view the number 120 is a numerological proof of the interconnectedness and sympathy between different parts of the universe. Sela calls it "a cosmological constant" (Sela 2003, 321).

4.4.3 The Name of God and the great conjunction

What Sela fails to address, mainly because his is not intended as a systematic examination of Sefer ha-Olam but is instead a thematic treatment of Ibn Ezra's scientific works in

²¹ In traditional Jewish practice, neither of these names are usually pronounced or even written out as I have just done. YHWH is replaced with *adonai* and yah with *tw*.

general, is precisely *why* this entire point is made at the beginning of Sefer ha-Olam, a treatise on mundane astrology. Ibn Ezra provides no explanation whatsoever for the inclusion of this theme, which is apparently entirely foreign to the subject matter of the text. The number of possible conjunctions does not bear any intrinsic astrological significance, as it is only the position of the conjunction relative to other celestial bodies and coordinates that are astrologically significant. Its presentation in the commentary on Ex. 33:21 is easily explained by the metaphysical nature of the Biblical verse, but this is not the case in Sefer ha-Olam. Why then is it included in this text?

I suggest that the reason why the 120 conjunctions are presented in such detail in Sefer ha-Olam is to justify the important position of the Saturn-Jupiter conjunctions. The doctrine of the Saturn-Jupiter conjunctions is the most central principle of mundane astrology (Burnett and Yamamoto 2000, 582), and is presented as such in Sefer ha-Olam. In a revealing passage in Sefer ha-Olam, Ibn Ezra explains, following Abu Ma'shar²², that :

“The great conjunction indicates that a prophet will arise to establish a nation if the conjunction occurs in the 9th house or in the 3rd house [...] because these two houses indicate signs and wonders.” (Sefer ha-Olam 1937, 9.)

Some conjunctions, specifically the ones occurring between Saturn and Jupiter in 0° Aries, determined the time that a new religion was to be born. This also implies that the birth of world religions was predictable, since the conjunctions were predictable. This is the reason why the ascendant was so important to find out in advance. The conjunction would reveal when a new prophet would arrive, but the ascendant, if it could have been calculated, would have revealed the nature of his teaching.

I suggest therefore that the reason why Ibn Ezra presented the issue of the 120 conjunctions at length *before* he even introduces the basics of the Saturn-Jupiter conjunctions in Sefer ha-Olam, is that it serves as a religious justification for this doctrine. The doctrine of the Saturn-Jupiter conjunctions assigns a great deal of importance to these conjunctions in determining the fate of entire nations - even world religions and the appearance of prophets. This could be seen as religiously unacceptable by some. In order to justify the power inherent in such conjunctions, Ibn Ezra introduced the numerical connection between the conjunctions and the name of God. By demonstrating that there

²² Abu Ma'shar in On the Great Conjunctions (2000, 37).

was an intimate connection between the conjunctions and the Creator's name, the conjunctions were implied to be one of God's instruments of creation, thus making it seem natural that they would wield such great and recurring power even over religious affairs.

4.5 Science and religion in Sefer ha-Olam

4.5.1 Religious meaning in a scientific text

Despite the technical nature of Sefer ha-Olam and its apparent lack of religious material, even this text is equipped with important clues about Ibn Ezra's thoughts on the relationship between science and religion. In no case a text in which he intended to systematize his philosophical outlook, Sefer ha-Olam nonetheless indirectly reveals its author's convictions about the ways in which scientific and religious truths are related. In reading only Sefer ha-Olam, the reader has no way of knowing that it is intimately linked to religiously significant arguments, more completely expounded in his commentaries, and that several of its passages thus play a role in forming Ibn Ezra's ideology.

Most conspicuous is the purely mathematical treatment of the combinatorial problem of the 120 conjunctions. Indeed, it is the complete lack of non-mathematical explanation that makes it suspicious: surely there must be a reason why he presents this issue here at the outset, before presenting the main doctrine of his treatise. We can thus conclude that issues with religious meaning were introduced by Ibn Ezra in wholly scientific contexts, but this was done in a scientific language and in the form of scientific arguments.

4.5.2 Types of interaction in Sefer ha-Olam

The only explicit mention of religion is one of astrological correspondences of the monotheistic religions, a very brief and detached mention of "religions" as classifiable

objects equivalent to any other cultural units. In assigning astrological signs to these units one could place them on the temporal map that was the horoscope. Then their fates could be predicted in the same manner as could every other human endeavor, and it is precisely this that is significant - religion interpreted as a human endeavor. The issue as presented in *Sefer ha-Olam*²³ suggests a relation of *domination*. But instead of religion dominating science, it is the opposite. Religion in this view has been reduced to an object of scientific, in this case astrological, classification, and different religions are different precisely because of their different astrological circumstances. This was in sharp contrast to Jewish claims of particularity. Therefore, in his Biblical commentaries he presented a harmonizing idea: that true faith, which always entailed a highly developed intellect, was capable of overriding the normal rules. Thus religion, under ideal conditions, could be something that broke out of this classification. This harmonizing device restored the argument to one in favor of *dialogue* between science and religion. In a sense, it was even an argument for their *integration*, because the implication of this view was that proper Jewish faith was the sole force in the universe capable of compelling God to override the rule of the stars.

Although Ibn Ezra was primarily a spokesman for the necessity of scientific learning and its compatibility with religion, he did not always and uncritically endorse the *dialogue* paradigm. We have seen that he argued, against the Karaites, that one could not base the correct observation of rituals on science alone. In the case of the calendaric controversy, science was deemed incapable of determining, as the Karaites would have it, the correct times for religious observations. For Ibn Ezra, this was the reason why one must turn to rabbinic tradition for instructions. Here we have an example of the *triangle-situation*. Just as astrology was the “other science” with which religion interacted in his life and thought, here Karaism is the “other religion” with which science interacts. Science is involved in this argument in the way that Karaism is rejected by Ibn Ezra not on religious but on scientific grounds. He shows that their claim that they could use science alone to interpret Scripture is impossible and is based on an incomplete appreciation of the complexity and proficiency of science.

On a deeper level, Ibn Ezra's opinion that when science fails one should turn to rabbinic tradition either directly or through the mediation of Ptolemy, betrays a touch of the “*God of the gaps*”-argument. If one should turn to tradition when science fails, does it not mean

²³ *Sefer ha-Olam A*, which is the version that the translation is based on.

that where science is successful one should follow it? In the 12th century, this would not have been seen as a treacherous idea, since there was so much more that science had not explained or even conceptualized. But here also, the matter is not so simple. Even if scientific knowledge was accorded a separate realm from tradition, tradition was only part of what constituted religion. The Karaites did not dispute the authority of the Biblical text, and hence it was not mentioned in the argument. So once again a deeper plurality of religion is found.

In dealing with the combinatorial problem of the 120 conjunctions, Ibn Ezra simultaneously makes the point that while the planets and their combinations determine the emergence of the most comprehensive units of human culture, even world religions, these conjunctions were not part of an arbitrary or impersonal machinery, but instead they were a manifestation of the will of God. This was demonstrated by the numerical equivalence to the Name of God. It thus became much more religiously acceptable that the recurring conjunctions of the planets should have such power over humanity's destiny. This passage must be seen as a prime example of the aim to *integration* of science and religion. The concepts of mathematics, astronomy, astrology and religious discourse were interwoven so as to complement each other in a complex construction of esoteric knowledge. The new information produced by such integration, that the conjunctions were spiritually kin to the divine creative force, was dependent on the contributions of all those disciplines for its sustainability.

5 CONCLUSIONS

5.1 The results of this study

This study has examined Abraham Ibn Ezra's mundane astrological treatise, *Sefer ha-Olam*, in light of the interaction between science and religion in history. I have discussed the role of science and religion and their interrelations in Ibn Ezra's life, in his thought and in his sources, and conducted a focused analysis of those roles in *Sefer ha-Olam* specifically, as they are illuminated by comparisons with his Biblical commentaries. Using

a modification of John Polkinghorne's typology including four types of interaction between science and religion, I have analyzed three themes which stand out from the text of Sefer ha-Olam in terms of *dominance*, the “*God of the gaps*”-argument, the *triangle situation* and *integration*.

The relationships between science and religion that Ibn Ezra faced in the societies which he visited varied widely. Not only was the relationship different at different times and in different places, but the same authorities which condemned one science, greatly furthered the study of another. Ibn Ezra grew up under a liberal Muslim rule, but left Spain when the new Muslim rulers were condemning astrology. Within Judaism also, there were different interpretations: The Jew of Rome were conservative and the Provençal Jews were liberal in this respect. This plurality of both “sciences” and “religions” as actors in the relationship between science and religion is a key element of the complexity thesis, and it demonstrates the fruitfulness of the *triangle-situation* as a historical category.

Ibn Ezra's work includes statements that promote the sciences as an indispensable element in proper religious life but also statements that criticize the divorcing of Scriptural interpretation from rabbinic tradition in favor of science, an indication that he was not prepared to allow either one to dominate over the other, but that he sought rather to *integrate* the two fields of knowledge. In his choice of scientific sources, he referred to Arabic and Greek sources as much as he did to Jewish ones, and did not favor Jewish scholars like Abraham Bar Ḥiyya. But on the other hand he did favor Ptolemy for furthering Ibn Ezra's own religiously inspired ideology that science was originally the discovery of the Jews. This also shows that he wanted to keep both science and religion intact in their mutual integration.

A similar complexity is evident in the themes that arise from Sefer ha-Olam. While in this text, Ibn Ezra promoted the view that religion was a cultural entity subject to astrological classification, his Biblical commentaries reveal that he also believed that given the right circumstances faith could also help overrule the decrees of the stars. In the discussion of the length of the solar year, Ibn Ezra suggested that when science fails to provide adequate answers in astrological matters, one should turn to Ptolemy, an argument which was essentially equivalent to the one in which he suggested that one should turn to tradition when science fails to determine the right course of action. Because in Ibn Ezra's mind,

Ptolemy was always in agreement with ancient rabbinic teaching, both arguments are ultimately critique against the Karaite notion of reliance on only Scripture and science, and for the validity of rabbinic tradition. This passage again shows a case where more than one “religion” was involved. Ibn Ezra's treatment of the 120 conjunctions exemplifies the attempt to achieve full integration of religious and scientific concepts. By stating that the number of possible conjunctions among seven planets was arithmetically connected to the numerical value of the Name of the God of Israel, Ibn Ezra attempted to prove that there was a religiously sound reason for the astrological centrality of the great conjunctions of Saturn and Jupiter in determining religious affairs.

Having modified Polkinghorne's typology so as to better suit a medieval context, I have acquired tools with which to conceptualize the complex relationships between science and religion in Ibn Ezra's thought and in *Sefer ha-Olam* in particular. No previous study has been devoted to this particular text, and it is therefore evident that this is in some ways a preliminary study, requiring further specifications in the future. But what this preliminary examination has shown quite clearly is that the actual relationships that arise from the text hardly ever fall neatly into the categories of a typology like this one. I have argued that in every instance of interaction between science and religion, more than one of the categories were needed to explain the true complexity of the situation. Nevertheless, in my opinion a typology of this kind is an excellent conceptual aid in the discernment of different types of interaction between science and religion in the past, and could be developed further for these purposes. Not surprisingly, this study vindicates the complexity thesis in that it reveals multiple relations in almost all instances of interaction, but it also takes steps to advance the use of a typology of the kinds of interaction that can be used in systematizing complex historical material in terms of the relationship between science and religion. The usefulness of such a typology is clearly demonstrated by the new insights it has provided into the dynamics between scientific and religious elements in this astrological text by Ibn Ezra.

5.2 Suggestions for further research

It is my intention to pursue this subject further in the near future. In my opinion, the undertaking of this further research must proceed on several levels simultaneously. First of all, a more authoritative translation needs to be based on a representative number of actual manuscripts, both of Sefer ha-Olam A and Sefer ha-Olam B. From my current location, the nearest manuscripts are found in St. Petersburg in the *Institute of Oriental Studies of the Russian Academy of Sciences*, to which the University of Helsinki apparently has warm relations. Others to which reasonably easy access could be obtained are found in the *Bibliothèque Nationale Française* in Paris, in the *Bodleian Library* in Oxford and in the *Biblioteca de la Real Academia de la Historia* in Madrid (Smithuis 2006, 300-22).

Secondly, a more thorough study of its contents requires access to all seven of the texts of the astrological encyclopedia in the original Hebrew. And third, it also presupposes a deeper familiarity with several of the Arabic astrological and astronomical texts which were Ibn Ezra's principal sources: Abu Ma'shar, al-Kindi, Masha'allah and Al-Qabisi. This would also entail a reasonable command of the Arabic language, something I have not yet had the opportunity to acquire.

On a more theoretical level, the special place of astrology in the scientific Arabic and Jewish thought of the Middle Ages also calls for some further conceptual considerations. Whether those considerations would take as their starting-point the relationship between science and religion, as I have done here, or something entirely different, still remains to be decided.

APPENDIX 1. ASTROLOGY

a. Basic astrological concepts

Understanding Ibn Ezra's texts requires a certain amount of familiarity with astrological concepts and doctrines. This is why I have decided to provide here a short introduction to astrological doctrine, trying to provide the basics of what I think Ibn Ezra expected his readers to know beforehand. All these concepts occur repeatedly in the text of Sefer ha-Olam and the other astrological texts, and it will prove impossible to follow Ibn Ezra's arguments without immediate recourse to the significance of these basic concepts. None of these however, are Ibn Ezra's innovations, but are standard astrological doctrine. I have taken these concepts from a large number of sources, as they are common to all astrological texts. I should mention however the introduction to Jim Tester's "A History of Western Astrology" (1987) and Nicholas Campion's "What do Astrologers Believe?" (2008). The Hebrew terms are specific to Ibn Ezra, and used in his astrological texts. They are thus not necessarily the ones used by modern Israeli astrologers. In most cases the Hebrew terms are taken from the glossary of Sela's translation to Sefer ha-Te'amim (2007, 377-390), but I have borrowed a small set of terms from Meira Epstein's translation of Sefer ha-Moladot (2008, 89-96). These latter ones I have marked with [ME].

First of all, the physical universe in which Ibn Ezra operated was conceived in contemporary astronomy to be according to the aristotelian-ptolemaic model. This is briefly as follows: the earth was a stationary sphere in the middle of the universe, and around it, like the peels of an onion, were the seven spheres of the seven moving celestial objects, referred to as planets, although they included the **luminaries** (*ha-me'orot*) (the sun and the moon). Each planet moved on its own course within its own sphere. Closest to the earth was the moon, and then the order varied slightly, but the most common was Mercury (*kokhav chammah*), Venus (*noga'*), sun (*ha-shemesh or chammah*), Mars (*ma'adim*), Jupiter (*tsedeq*) and Saturn (*shabbetai*). The farther planets, Uranus, Neptune and the recently "non-planet-declared" Pluto were not to be discovered for centuries to come, as they are practically impossible to observe with the naked eye. Throughout the Middle Ages astronomers and astrologers alike operated with these seven celestial bodies, usually in this order. (Tester 1987, 4.) Note that apart from the geo-centricity, the order of the

planets is essentially correct. Ptolemy had specified additional orbits called **epicycles** (*galgal qatan*) around a larger orbit called **deferent** (*galgal gadol*), to explain inconsistencies in planetary motion. These were later made redundant by the heliocentric model of Copernicus (Lindberg 1992, 98-105, 248-252).

Outside the planetary spheres was the **upper sphere**, (*galgal ha-elyon*) in which lay the **fixed stars** (*mazalot*), which is what the stars were called, because as opposed to **the planets** (*kokhavim* or *meshartim*) (which were also called "the moving stars"), they were almost stationary. Of the fixed stars, those constellations that lay along **the ecliptic** (*cheshev ha-afudah*) (that is, the apparent path of the sun and the planets across the sky and around the earth) formed the so called **zodiac** (*galgal ha-mazalot*). This circular path, the ecliptic, was divided into twelve equal parts, each named according to the constellation found therein: these are the familiar zodiacal signs: Aries (*mazal taleh*), Taurus (*shor*), Gemini (*te'umim*), Cancer (*sartan*), Leo (*aryeh*), Virgo (*betulah*), Libra (*moznajim*), Scorpio (*'aqrav*), Sagittarius (*qashat*), Capricorn (*gedi*), Aquarius (*deli*) and Pisces (*dagim*). The astrological year begins when the sun enters Aries, the first sign, and this moment is called **the Aries ingress** (*hikkanes ha-shemesh be-mazal taleh*), and corresponds to the vernal equinox.

Beginnings (*techillot*) are seen as very important in astrology, and the planetary positions at the moment of the beginning of anything (a life, a project, a year) is seen as highly indicative of the course that that thing will subsequently take. This is why the word "beginning" is mentioned so frequently in Sefer ha-Olam.

A medieval astronomer and/or astrologer had two instruments at his disposal: **the astrolabe** (*keli ha-nehoshet*) and **astronomical tables** (*luhot*). The astrolabe measured the distance between celestial objects and made comparative measurement possible, thus enabling the astronomer to follow the course of those objects. The tables were simply the lists in which these observations were recorded. All astrologers did not make astronomical observations themselves, but many used only tables which were not always accurate, and this is the object of vehement criticism by Ibn Ezra in the opening lines of Sefer ha-Olam (1937, 8). Modern scholarship has confirmed what Ibn Ezra says here: it was indeed rare for astrologers to make actual astronomical observations themselves, despite claims of experience (*nissayon*) as the foundation of their data (Lehoux 2003, 233-239). In contrast, we know for a fact that Ibn Ezra made real observations in Pisa and in Lucca (Sela 2003,

26).

Each of the zodiacal signs had a particular nature and certain properties. There were many ways to group the signs, but the most universal was probably the division into **triplicities** (*shlishiut*). There are four groups of three signs each, thus four triplicities. Every triplicity is connected to one of the four elements, and therefore there is a triplicity of fire (*esh*), one of air (*awir*), one of water (*mayim*), and one of earth (*afar*), each including three signs. The fire-triplicity for example includes Aries, Leo and Sagittarius. All signs also have various relationships to other signs, as well as certain relationships to certain planets: Aries has a special relationship with the planet Mars, as it is its own planetary house, or **domicile** (*bayit*). Therefore, Mars is at home in Aries, and is thus strengthened whenever it's there. Aries also has a special bond with the sun, as the sun is said to be in its **exaltation** (*kavod*) in Aries, meaning that the sun is strong there, although whether a planet is stronger in its planetary house or in its sign of exaltation varies. Each planet also has its own set of properties and areas of influence. Thus for example, Jupiter is said to be a **benefic** (*tov*), meaning that its influence is beneficial. Because it is one of the two **superior planets** (*kokhavim ha-elyonim*), meaning the two greater and farther ones (Jupiter and Saturn), its positive influence is very strong. For human beings Jupiter indicates justice, peace, faith, generosity and laws, among other good things. As a superior planet, he can overrule the influence of the lesser malefic one: Mars. The **malefics** (*ra'* or *maziq* [ME]) are Saturn and Mars, which exert a regular negative influence on humans. But Jupiter cannot override Saturn's influence since Saturn is also a superior planet. Thus a kind of hierarchy is established among the planets. Each planet is at home in its own domicile or domiciles, exalted in another sign, and in its detriment and dejection in yet other signs. While in its sign of **detriment** (*sin'ah* [ME]) or its sign of **dejection** (*qalon*) the planet is weaker and its influence is therefore moderated, whether for less bad or less good depending on the nature of the planet.

Perhaps the most important factor that modify these predetermined influences of the planets is when they are in **aspects** (*mabat*) with each other. Aspects are significant angles between the positions of different planets. Imagine a circle of 360 degrees within which seven points (the planets) revolve around the center at different speeds, and at any given moment they are positioned somewhere on that circle. The astrologer looks for geometrically regular angles between two or more of these points at the moment of birth or

at another particularly relevant moment. The significant angles are: 180 degrees, called **opposition** (*nokhach*), which means that they are opposite each other on the circle, 90 degrees, called **quartile** (*mabat revi'it*), 120 degrees, called **trine** (*mabat shlishit*), since it is a third of the circle, and 60 degrees, called **sextile** (*mabat shishit*), since it is one-sixth of the circle. The aspects of opposition and quartile are considered maleficent aspects, that is, two planets with 180 degrees between them at a given moment are at that moment hostile to each other, which affects the influence that they have at that moment. Quartile aspect is also maleficent but less so. Trine is considered a beneficent aspect, meaning that two planets with 120 degrees between them at a given moment, support each other at that moment, modifying their influence to the better. Sextile is similar but weaker. The aspects are considered by Ibn Ezra as extremely important, and he even closes Sefer ha-Olam, and at the same time the whole astrological encyclopedia, with a reminder to always take the aspects into account, "because all (astrological) judgments rest upon them" (Sefer ha-Olam 1937, 19).

There is yet another set of astrologically crucial orientations within this circle. Astrologers are interested in how the four so called **cardinal points** (*pe'ah*) are situated at a chosen moment. The **ascendant** (*mazal ha-tsome'ah*) is the point on the ecliptic just about to rise above the eastern horizon at the given moment. The zodiacal sign, and even the exact degree which is "rising" at that moment, is considered essential to the outcome of the horoscope, whether that means the life of an individual or the fate of a city or the coming rainfall in the beginning year. The point that is 90 degrees further from the ascendant above the horizon is called **midheaven** (*hetsi shammayim*), and is considered to have great influence as well, sometimes even more than the ascendant. 90 degrees further still we find the **descendant** (*mazal ha-shoqa'at*), the point that is just about to fall underneath the horizon, and after yet another 90 degrees, opposite the midheaven, we find the **lower midheaven** (*ha-tehom*). The latter two are always described as less influential, as their position indicates influences that are waning or ceasing. The importance of the ascendant and midheaven rests on the assumption that they indicate influences that are growing and culminating at that moment²⁴ (footnote: for this system, see Tetrabiblos 1940, 169, where Ptolemy is quite explicit about this!). Thus the cardinal points become a kind of visual graph of the process that is thought to begin at the chosen moment. The **astrological houses** (*batim*), not to be confused with the planetary houses, are twelve equal sections of the circle based on the cardinal points. Thus the 30 degrees of the first house begin at the

²⁴ See Ptolemy's Tetrabiblos, where he is quite explicit about this (Ptolemy 1940, 169).

ascendant, the second begins 30 degrees further, and so on. The houses that begin at the cardinal points are called **cardines** (*ha-yetadot*), and they are the 1st, the 4th, the 7th and the 10th houses. The 2nd, the 5th, the 8th and the 11th are called **succedents** (*ha-smukhim*) because they follow the cardines, and the remaining ones are called the **cadents** (*ha-noflim* [ME]) or falling ones, because they are seen as somehow waning in power. Each astrological house has a certain area of life that it governs: the ninth, for instance, governs long travels and religious faith. All this is relevant to any basic astrological reading, and was so already in the Middle Ages. These things were certainly known to and accepted by Ibn Ezra, and he would have assumed the reader of *Sefer ha-Olam* to know these things beforehand.

Special conditions affect the normal course of the planetary influences. The apparent course of the planets around the earth is not evenly circular in its speed nor in its direction. We now know that this is due primarily to two things: the planetary orbits are not circular but rather oval in shape, and more importantly, the centre of their orbits is the sun and not the earth. Seen from the earth and assuming it to be the center, the planets Mars, Jupiter and Saturn (those that are actually further away from the sun than the earth) seem to move at different speeds at different times and stopping at certain intervals and moving backwards for a while, only to resume its original course again shortly. A planet that appears to be moving backwards is said to be **retrograde** (*shav akhoranit*), and was considered detrimental to the planet in question, making it practically impotent. Another way in which a planet could be rendered practically impotent was if it was **burned by the sun** (*nisraf*). This occurred when it was in or close to a conjunction with the sun, which because of its great power eclipsed all other planets. When this occurred, the planet's own influence was drowned in the more potent influence of the sun.

b. Medieval mundane astrology

As part of Ibn Ezra's astrological encyclopedia, *Sefer ha-Olam* represents the branch of mundane astrology, as mentioned above. A brief introduction to the most central doctrines of medieval mundane astrology are therefore in order, to make the subject matter of the text appear clearer. Developed in India and refined in Sasanian Persia, mundane astrology was originally based on Greek genethliological astrology, which is the branch dealing with

casting birth-charts (Burnett and Yamamoto 2000, 573-578). Mundane astrology dealt with predictions concerning collectives; natural or socio-political changes that affected whole communities could be predicted by mundane astrological techniques.

The predictive techniques of mundane astrology rest on the calculation of different kinds of periods, which in a cyclical manner repeat themselves and to different degrees repeat the political or natural changes in the human world as well. We must begin with the notion of the world-year, a concept not unfamiliar to the Greeks, but developed by the Indian astrological tradition. In the beginning of the world-year, all the planets have returned to the places where they had been when time itself began. In accordance with astrological interpretation such a return of planets would make the world begin anew. The world would then begin in a new cycle where events would unfold in a closely similar fashion as they had during the first cycle. That this doctrine was developed in India may perhaps be explained by the Vedic tradition of recurring creation and destruction of the world. When these doctrines were translated into Arabic in the 7th century A.D., there was a great number of different periods considered as significant for the prediction of world events. Among the most important writers to import these doctrines into the Arabic cultural sphere were Masha'allah, al-Kindi, al-Battani, and of course Abu Ma'shar. (Pingree 1968; 1997, 39-50; Burnett and Yamamoto 2000, 573-613.) Ibn Ezra mentions all of those men in this text.

Mundane astrology's most central system of periods is based on the conjunctions of Saturn and Jupiter. As Ibn Ezra explains in the beginning of *Sefer ha-Olam* (1937, 8), since Saturn and Jupiter move slowly, they indicate things that change slowly, thus not individual things or details, but general matters and broad issues. The conjunction of these two planets occurs in Aries every 960 years, and such a conjunction is referred to as the Great conjunction, but they are in conjunction again in another fire-sign in no more than 20 years, which is a small conjunction. After conjoining in the fire-signs 12 or 13 times, the planets' conjunction begins to occur in another triplicity, this time in air-signs. The jump from one triplicity to another is called a middle conjunction. The rarer the recurrence of the conjunction, the more general and universal the interpretation. A smaller period than the small conjunction was the very important **revolution of the year** (*tequfat ha-shanah*), which was an annual horoscope cast at the beginning of each year (at the Aries ingress) to forecast the year's events. Although the revolution of the year was not based on the Saturn-Jupiter conjunctions, it was especially significant in such a year when one of these

conjunctions was calculated to occur. (Burnett and Yamamoto 2000, 582-584.)

Just as in other forms of astrology, the *beginnings* of different astronomically motivated periods between recurring events such as **conjunctions** (*mah̄barot*), were seen as astrologically significant moments. The positions of the planets at the beginning of the year of such an event were seen as highly indicative of the events to unfold on Earth during the period which was about to begin. Again, the rarer the beginning of the period and the longer the period which was beginning, the stronger was the influence of the annual horoscope and also the more general and universal. A great part of Sefer ha-Olam is concerned with all the astrological relationships one should observe in the horoscope of the revolution of the year, and what different observations would indicate for the nations involved. (ibid.)

APPENDIX 2. SEFER HA-OLAM, AN ANNOTATED TRANSLATION

a. Some preliminary notes on Ibn Ezra's technical terminology

One of the most striking of Ibn Ezra's achievements is the creation of a new scientific terminology in Hebrew. Jews had written about scientific matters for centuries within the cultural sphere of Islam, but they had always done so in Arabic, which had become the lingua franca in all Muslim areas. Abraham bar Ḥiyya (1065-1140) was a Jewish Andalusí scholar who lived slightly before Ibn Ezra. Bar Ḥiyya wrote philosophical and scientific works, much like his contemporaries, but the difference between them and him was that he wrote all of his works in Hebrew, which had usually been a language reserved for liturgy and poetry (Sela 2003, 96-97).

Bar Ḥiyya had a reason for writing in Hebrew: there was an increasing demand for scientific literature among the Jews of Provence and northern France, and since these areas were outside of the Islamic cultural sphere, those Jews could not read Arabic, the language of science in the 10th -11th centuries. Bar Ḥiyya's strategy for creating new words was mainly eclectic: he gave new, scientific meanings to existing Biblical or Mishnaic words, he borrowed Arabic terms or resorted to loan-translations (Sela 2003, 98; Tsarfati 1969, 61-129).

Ibn Ezra was very much influenced by Bar Ḥiyya's vocabulary, but because of his linguistic ideology, his Hebrew was more prone to Biblical purism. He attempted to avoid Arabic influence and loans and within Hebrew, preferred Biblical over Mishnaic words (Tsarfati 1969, xi-xii). Ibn Ezra had a strong ideological basis that guided his strategy for creating vocabulary. He believed that the Hebrew language had originally been the most comprehensive language, but had since been partly forgotten. He also believed that science had originally been the invention of the Hebrews, only to have been forsaken by the Jews and subsequently stolen by the Greeks (see section 3.3.2.).

Therefore Ibn Ezra opted for a very interesting linguistic scheme. He sought out Biblical words which he interpreted as bearing a hidden scientific meaning. Thus a Biblical word meaning "laws" or "statutes" (*mishpatim*), acquired the additional meaning of "astrological judgments" (ibid. 116-123). The Biblical word meaning "servants" (*meshartim*) became "planets", in accordance with Ibn Ezra's doctrine that the planets were will-less servants of God (ibid. 129-130). To represent the ecliptic, the all-important line of the sun's and the

planets' movement across the sky, he chose the word *heshev ha-afudah*, which in the Biblical text designated the girdle of the ceremonial dress of the high priest Aaron. Ibn Ezra believed that this girdle featured some kind of representation of the heavens (ibid. 137-139). There is thus a wealth of ideological assumptions behind Ibn Ezra's choice of words. This should not, however, lead to over-interpretation: in this technical context, the ecliptic usually meant only the ecliptic and so on.

In the following translation of *Sefer ha-Olam*, I have relied in terminological matters on Shlomo Sela's translation of *Sefer ha-Te'amim* (2007). I am also indebted to Tapani Harvianen and Haseeb Shehadeh of the Institute of Semitic Languages and Cultures at the University of Helsinki for their valuable help and critical insights into this text and its translation.

b. Translation of *Sefer ha-Olam* from J.L Fleischer's edition of 1937 with explanatory notes

The Book of the World according to our rabbi Abraham Ibn Ezra

*Through the power of the Living God,
hidden from all,
he²⁵ will begin the Book of the World.*

[lines]

[1-4] If you have come across the book by Abu Ma'shar on the conjunctions of the planets²⁶, do not accept it, and do not listen to him, because he relies on the conjunctions of the planets by mean motion, and no scholar agrees with him, because the truth is that the conjunctions are relative to the wheel of stars (the zodiac). Also do not rely on the conjunctions of the planets that are in the (astronomical) tables of the scholars of India, since they are not altogether correct, and the correct (thing to do) is to rely on the tables of the scientists who made observations from generation to generation²⁷.

[4-11] The conjunctions are 120 (in number). And this is how you can learn their number: it is known that every calculation that adds from one to any number that one wishes, one can

²⁵ Ibn Ezra refers to himself in the third person later in the text, as "Abraham says..." and also in the concluding poem. It is however, possible that this should read "I" instead.

²⁶ Abu Ma'shar's *On the Great Conjunctions* (ed. and transl. Burnett and Yamamoto 2000).

²⁷ Ibn Ezra's critique of Abu Ma'shar in this passage is motivated by the fact that Abu Ma'shar uses Indian astronomical tables of mean motion (Abu Ma'shar 2000, 13), which are not sufficiently accurate. Ibn Ezra holds that one must make continual observations to assure that the predictions are made from when conjunctions actually occur instead of only when they are calculated to occur.

obtain by multiplying²⁸ the latter value with its half plus its half²⁹ Here is an example: we wish to know the sum of the numbers of one to twenty. We will multiply twenty with its half and add its half, and we get 210. And now we begin to find out how many combinations (there are) of two planets only. And it is known that the number of planets is seven. So Saturn can combine with the six other planets. And six (multiplied) with its half plus the half of it is twenty-one. And thus is the number of combinations of two (planets).

[12-16] We wish to know the number of conjunctions of three (planets). Here we begin by putting Jupiter and Saturn with one of the other five, and thence we get the number five. And we multiply it by two and a half, and add half of it and thus (we get) fifteen. And the conjunctions of Mars are three which we multiply with two and arrive at six³⁰. And the conjunctions of the sun are two, which we multiply with one and a half and get three³¹. And the conjunction of Venus with the inferior planets is (only) one, and thus the whole number is 35³². And these were the numbers of the combinations of three planets.

[16-23] We wish to produce the conjunctions of four (planets). Then we begin with Saturn and Jupiter and Mars with it (a fourth planet). Since three combining with it are required, the conjunction begins with four that we multiply with two plus its half³³ and get ten, and after that are the conjunctions of Saturn and Jupiter with the others, and these will be three that we multiply with two is six, and thus (we get) 16. And after that we begin by (combining) Saturn with Mars and they are $2 \times 1,5 = 3$ and after this is one conjunction, and thus the number of Saturn's conjunctions amount to 20. Then one begins by combining Jupiter with 3 and we multiply them with 2, which equals 6 and after that (there is) one conjunction, thus 4 conjunctions³⁴. And the conjunction of the sun with the inferior planets³⁵ is one. And thus the conjunctions of four (planets) are 35 (in all).

[23-26] We wish to find out the (conjunctions of) five (planet)s, and we found that Saturn has 15, Jupiter 5 and Mars one, and thus the conjunctions of five (planets) are 21. And the conjunctions of six (planets); Saturn has 6 and Jupiter 1, thus 7, and the conjunction of seven (planets) is (just) one.³⁶ Thus the number amounts to 120 conjunctions. All the (sums of the) conjunctions are uneven numbers, and are divisible by 7³⁷.

[27-33] The “great conjunction” is a conjunction of Saturn and Jupiter in the sign of Aries. And that is because they are heavy (and therefore slow) planets. And thus they do not indicate³⁸ details, but general (matters). And since Aries is the first of the signs (of the zodiac), this is why it is called the great conjunction. And this conjunction occurs approximately (every) 1000 years, because such is the course of movement of these two (planets). After they join together in Aries, they join together after 20 years in a house in the triplicity of Aries³⁹, and it is Sagittarius. And it is the ninth sign from the sign where the first conjunction took place⁴⁰. After another 20 years they join together in a house of the one triplicity, and it is Leo, which is the ninth from Sagittarius.

[33-42] And after 60 years from the first conjunction they join together in Aries where they started at the beginning, since it is the ninth from Leo, except that they do not join together

²⁸ Ibn Ezra uses the word *erekh*, which means value, to denote ratio or proportion or multiplication (Sela 2007, 388).

²⁹ $A(1 - n) = n(n/2) + n/2$.

³⁰ According to the formula given above, this should be $3 \times 1,5 + 1,5 = 6$, rather than $3 \times 2 = 6$ as given here.

³¹ $2 \times 1\frac{1}{2} = 3$.

³² $5 + 15 + 3 + 6 + 2 + 3 + 1$.

³³ $4 \times 2 + 2$.

³⁴ Ibn Ezra does not seem to follow the formula he has just set out himself. It may also be a copyist error.

³⁵ Venus and Mercury are called “inferior planets” in astrological thought. Saturn and Jupiter are correspondingly “superior planets”, leaving Mars alone without such epithet.

³⁶ Sela has translated this passage in equivalent terms in Sela 2003, 381. He also translates *erekh* as multiplication in this context.

³⁷ For an analysis of the number of the conjunctions in this text, see section 4.4. of this study.

³⁸ Ibn Ezra repeatedly uses the word *yoreh* as the signification or representation by the astrological sign of the earthly event, in a way that is best translated as “indicates”.

³⁹ This means in one of the fire signs.

⁴⁰ In Aries.

at the same degree, but instead approximately in quartile⁴¹ to another sign. And so they do for 240 or 260 years, and thus they join together in the houses of a triplicity 12 or 13 times. And after that they move out of the fire-signs to the earth-signs that are next to them. And when they begin to move there, it is called a “middle conjunction”. And thus they proceed from triplicity⁴² to triplicity until the end of 12 or 13 times. After this they move to the triplicity of the air-signs, and after that to (that of) the water-signs according to the rule that I have mentioned, and in nearly 1000 years they will return to join together in Aries. And thus their conjunction every 20 years in one of the three houses of any triplicity, is called a “small conjunction”.

[42-44] The great conjunction indicates that a prophet will arise to establish a nation⁴³, if the place where the conjunction occurs is in the 9th house or in the 3rd house relative to the ascendant, in the revolution of the year⁴⁴ of the conjunction, because these two houses indicate signs and wonders.

[45-51] Many believe that it is in their power to find out the ascendant in the hour of the conjunction of the superior planets. But this is not possible because of two things: one is that the location of Saturn and Jupiter is not equal in the tables of mean motion, or even in the tables of those scientists who make observations, even if we set aside the differences between the scientists of India and those who make observations, because they are today close to 9 degrees (different). On the other hand, if the place of Saturn becomes clear to us in the (tables of) mean motion, (and) also that of Jupiter, on the basis of any table that (relies on) observation, it would be true and correct. However, we would not be able to produce the moment of the conjunction, because of the movement of these two planets. And if we could know the date that they will join together, that would (already) be a great thing⁴⁵.

[52-58] And I shall give you additional reasons⁴⁶. *Ptolemy*⁴⁷ said “the scholars of our generation praise themselves because they are able to produce the ascendant for any location at the revolution of the year, which is at the moment of the Aries ingress. And I say: I cannot know it. Those who were before did not know it, nor will those who come after”. Abraham says: now I shall explain to you Ptolemy's reason. Know that no person can know exactly how long a solar year is. And the reason is that in a year, the sun returns to the center of the intersection of the two great circles⁴⁸ of which the beginning point is northern/hidden⁴⁹, and the instruments that are made for determining the apogee of the sun at noon, if they are sufficiently precise, they will be able to produce the minutes but not the seconds⁵⁰.

⁴¹ In counting from any sign to the ninth from it, that ninth sign will be in quartile aspect to the original sign.

⁴² A triplicity is a group of three zodiacal signs of the same element. Thus the three fire-signs Aries, Leo and Sagittarius form one triplicity.

⁴³ The Hebrew reads literally, to “arouse a people”. I want to thank Haseeb Shehadeh especially for drawing my attention to the meaning “to establish a nation” of this expression.

⁴⁴ The “revolution of the years” was a horoscope that was cast yearly at the beginning of the year in order to predict the circumstances of the coming year.

⁴⁵ In the preceding passages, Ibn Ezra has explained the basics of the Saturn-Jupiter doctrine, which correspond closely to Abu Ma'shar (2000, 11, 37-41). The reason why the ascendant is so crucial in this argument is that while the conjunction determines the time that a new era will begin, its ascendant, if it could be specified, would determine the nature of that new era. But the ascendant changes every two hours or so, and can therefore, according to Ibn Ezra, not be determined with accuracy. This argument is also critique aimed at Abu Ma'shar.

⁴⁶ I have here interpreted the Hebrew phrase “to add water to the Nile/river” as an idiom meaning to add proof to an already proven case. I have been unable to verify such usage, however.

⁴⁷ Ibn Ezra spells the names of both Ptolemy and Hipparchus in Arabic fashion, which is natural as this was his first language.

⁴⁸ The great and small wheels refer to the epicycle and deferent of the Ptolemaic cosmological model.

⁴⁹ *Tsafon* means northern and *tsafun* hidden. I am unsure which one he means here.

⁵⁰ The Hebrew words *rishonim* and *shiniyim* are here used for the terms “minutes” and “seconds” (of arc), see Sela's translation of *Sefer ha-Te'amim* 1.1:6 (2007).

[59-68] Already Shakir's sons⁵¹, who made three instruments that were the first to divide them, they also used to give them (a precision) of ten seconds. But when they were determining by them (the instruments) the apogee of the sun at noon, the dispute between them⁵² was about two minutes. And this is due to an error in the craft. If we say we shall measure the shadow on the ground (to determine the position of the sun), an error will equally occur there because of the ground if it is not level, and likewise because of the pillar (of measurement), if it is not straight, also in its erectness. And because of such things, all astronomers have been obliged to add precision (to the tables) generation after generation. *Hipparchus* already said that the solar year is 365 whole days and less than 1/4 day, but he did not know how much less. Then came Ptolemy after him and specified the date of the revolution of the year, and a way to approximate the moment, and so he did, and no person could know when (exactly) the Aries ingress occurred in a given location without knowing the latitude of that location, which means its distance from the equator.

[68-76] Therefore, they observe the measure of the sun's apogee at noon as it is at the end of North, which is at the head of Cancer, and also they determined how it was at the end of South, which is the head of Capricorn⁵³, and after they knew this, they could produce the latitude of the place in degrees and minutes if the sun's angle of inclination was correct. Because the scholars of India said that it is 24 full degrees, and Ptolemy said "more than 23 degrees and more than 45 parts⁵⁴ and less than 51 parts⁵⁵, so Ptolemy could not know the (exact) truth. And Hipparchus said that it is 11/83 parts in every revolution, and thus it is 23°51'. And Muslim scientists have specified more than all of them, and their knowledge agrees that the angle of inclination is 23°35', except for *Yahya b. Abu Mansur*⁵⁶ and *Ibrahim al-Zarqal*⁵⁷, who specified even more than all of them and they said that it is 23°33'.

[76-96] After one knows the latitude of the country in degrees and in fractions, one will (be able to) determine the sun's apogee at noon when it is close to the Aries ingress, and from that one knows it. Here is an example: we are in a place with the latitude of 42°39', it turns out to be the first apogee, and its reason is that the Aries ingress occurs at 47°30'. And then we measure the sun at noon before the Aries ingress and we find it at 47°20'. Also we take the apogee of the sun at noon the following day, and it ought to be at 47°44', and the reason for this is that the inclination of the sun is on that one day, when it (enters) in the sign of Aries, close to 24°. And thus 1' is added to every hour of both day and night. And we have already said that the apogee of the sun the preceding day was 47°20', and thus 10' remain to complete the apogee of Aries in our (chosen) locality, then we know that 11 hours after midday the Aries ingress will occur, which is 4 hours from nightfall. And since there is a long time-gap between the beginning of the year as one of the astrologers specified and (the value given by) another astrologer who came after him, because they both agreed that no person can specify them by minutes, until they amount to days. And therefore the latter scholar divided the measure of time that was between him and his predecessor, and produced the mean motion of the sun. And if the predecessor erred slightly, the error will be found in the successor, because one relied on the other, since there was nothing else he could do. And in this manner Ptolemy found in relation to the estimation of time (made by) Hipparchus, that the solar year was less than 1/4 plus the three hundred and sixty(five) days. And the time (that elapsed) between him and Hipparchus was 280 years⁵⁸. And Ptolemy said that the position of the sun's apogee is in Gemini 6°, so it had been, and so it will be always. And many more people (who) made specifications came after him, and they were no less wise than he was, and during the 720 years (that have elapsed) between them

⁵¹ The Banu Musa, Musa Shakir's sons; Muhammad, Ahmad and al-Hasan were three brothers who were all scholars of mathematics and astronomy. They lived in Baghdad in the 9th century.

⁵² That is, between the data in the tables and the data of observation.

⁵³ The apogee is measured relative to the equator and to the tropics of Cancer and Capricorn.

⁵⁴ >23°45'.

⁵⁵ <23°51'.

⁵⁶ This is probably a reference to *Abu Nasr Mansur ibn Ali ibn Iraq*, ca 970-1036, notable for his discovery of sine-laws in astronomical trigonometry. He is also mentioned by Ibn Ezra in *Sefer ha-Moladot*, 2008, 71.

⁵⁷ *Abu Ishaq Ibrahim al-Zarqali*, ca 1028-1087, astronomer famous as the compiler of the *Toledan Tables*.

⁵⁸ Here Ibn Ezra is citing from Ptolemy's *Almagest* (Almagest VIII (3) 1984, 333; cf. Sela 2003, 304).

and Ptolemy, 400 more⁵⁹ to be added [?] on the mean motion of Ptolemy, up until now, and Ptolemy's tables have no relevance today⁶⁰.

[96-100] It is very surprising that such a great man who corrected the astronomical tables of mean motion made by al-Battani⁶¹, claimed that those were Ptolemy's tables⁶². These specialists found the sun's apogee to be, in their time, at Gemini 22°. Also Ptolemy said that the motion of the stars that are in the upper sphere⁶³, is one degree in every 100 years⁶⁴. But they found their motion to be 1,5° per 100 years.

[100-105] There are those who say that the amount that the year every year falls short of (365+) 1/4 day, is by 1/106 and those who say 1/110⁶⁵. But the correct way, I believe, is 1/131, and this is based on the position of the sun in *al-Sufi's*⁶⁶ time, and we have not heard that there was any specialist in astronomical calculation like him, and he taught like this. And after him came Ibrahim al-Zarqal, and there was no scientist like him in his generation, and he measured the position of the sun in his own time, and his method was equivalent to the one described by al-Sufi⁶⁷.

[105-111] And so it has been made clear for you that man is unable to know the ascendant from the revolution of the year, of which spoke Ptolemy, and the scholars of India, Egypt and Persia, and Doronius⁶⁸, because (instead), we shall always look for the moment of the conjunction of the luminaries or their opposition, (to find out) which of them is at the beginning (of the year) before the Aries ingress, so that we will be able to define it properly; therefore there is nothing anywhere that gets us as close to what we want (as this), and from this, we are able to specify and to know all mundane laws. And this is correct because the luminaries signify the world more than any of the planets (do), indeed the Muslims and all the Ancients admit that it is so.

[111-122] Ptolemy said: "Look whether the sun or the moon is eclipsed, and from this you can know all the events that will occur in that year". And he does not rely on anything else than the ascendant at the moment of the conjunction of the luminaries when the sun is eclipsed, or on the ascendant at the moment of the opposition of the luminaries when the moon is eclipsed, as I will later interpret it. And also look at the great conjunction for the ascendant in the conjunction of the luminaries or their opposition, (that is,) the cusp of which sign will be (just) before the Aries ingress. Also look for the rising sign at the moment of the conjunction of the luminaries or their opposition before the entrance of the sun into the beginning of the quadrant where the great conjunction is to occur, and also observe the rising sign at the moment of the conjunction of the luminaries or their opposition, which of them is before the great conjunction, that is, the conjunction that is to occur in the same month⁶⁹. And if the conjunction occurs in Aries, then there is no need to produce the ascendant, (it can be) only one alone. And if in the remaining quadrants, one

⁵⁹ Here Sela translates "there is a discrepancy of 400", but he also adds a question mark as to the meaning of this sentence. (Sela 2003, 368)

⁶⁰ They had been replaced by the much more accurate Arabic *zijas*. For an alternative translation of this passage, see Sela 2003, 368.

⁶¹ *Muhammad ibn Jabir al-Harrani al-Battani*, 850-929, astronomer from Harran, calculated the values for the precession of the equinoxes and the inclination of the Earth's axis as 23° 35'.

⁶² According to Sela, this remark is aimed at Abraham Bar Hiyya, and addressing him as a "great man" is sarcasm (Sela 2003, 99).

⁶³ The fixed stars.

⁶⁴ Ibn Ezra here speaks of precession. For Sela's, essentially equivalent translation of this passage see Sela 2003, 362.

⁶⁵ The meaning of this sentence is unclear to me.

⁶⁶ *Abd al-Rahman al-Sufi*, 903 -986, was a Persian astronomer and known in the west as *Azophi*. Al-Sufi published his famous "*Book of Fixed Stars*" in 964.

⁶⁷ I have analysed Ibn Ezra's treatment of the length of the solar year in section 4.3. of this study. This passage is also critique of Abu Ma'shar, insofar as Abu Ma'shar uses Persian years of exactly 365 days (Burnett and Yamamoto 2000, 582). Ibn Ezra makes the justified point that such inaccuracy accumulates into major discrepancies over time, especially since mundane astrology dealt with periods of many hundreds of years in its predictions and retrodictions.

⁶⁸ Dorotheus of Sidon, a 1st century Hellenistic astrologer, author of the very influential *Carmen Astrologicum*.

⁶⁹ The sun-moon conjunction that occurs in the same month as the great one.

must sometimes produce a second sign with the first; there are also times when one should produce two. But that will not happen unless the conjunction occurs in the first sign of the quadrant⁷⁰.

[122-131] And at the time of the conjunction, observe the circumstances of Saturn and Jupiter to see which of them is closer to its apogee or to the place of its perigee, relative to the great wheel, that its center is far from the centre of the earth⁷¹. And observe also which one of them is closer to its apogee on the small wheel⁷². And whether both of them are straight in their movement or they are retrograde and whether one of them has northern latitude, and how great its latitude is and observe also whether one of them is (as) ruler in (its own planetary) house (domicile). And so, if you find that Saturn is closer to its apogee than is Jupiter, or its latitude is northern while Jupiter is southern or it is on the ecliptic, or the latitude of Saturn is more northern than Jupiter's while it (too) is northern, or if Saturn is on the ecliptic and the measurement of how southern Jupiter is, or if they are both southern, and the latitude of Saturn is smaller than the latitude of Jupiter, also if Saturn is in the place where it has rulership, then it indicates that an old people that dwells in any inhabited place, will not be conquered and will not move from its place⁷³.

[131-140] According to the nature⁷⁴ of Saturn, hatred, envy, hostility, strife, famine and (all) sorts of diseases will increase in the world. And if all this influence⁷⁵ that we mentioned of Saturn and Jupiter (was the other way around⁷⁶), then it indicates a new people that conquers the old people, and the kingdom is turned from (the dominion of) one people to another. And in accordance with the aspect of Mars shall be the shedding of blood. If it is eastern, then many victims shall fall, and if it is western, there will be more fear and refugees than massacres. But if Venus aspects it with any aspect, its (Mars') malignancy will be removed. And always observe at the day of the conjunction, how the planets aspect each other, because it is an important principle, especially if Mars aspects with opposition or quartile then the world will be turned over with many wars, and if Venus, then the intercourse and fornication will increase with satiety, without wars. And if the moon will be in a beneficent place, everybody will be joyful, and the opposite will be the case if it will be with one of the malefics.

[140-148] The scientists of Persia said to always observe the portion that is called the *fardar*⁷⁷, and it returns again and again every 75 years. And such is their beginning, (that) the sun is at the beginning for ten years (and) she will withdraw to serve in the seventh

⁷⁰ The doctrine here presented is found in Tetrabiblos (Ptolemy 1940, 195-199) and is based on the new and full moon (conjunction of the luminaries or their opposition). Here this doctrine is meant to supplant the technique of using the ascendant of the Saturn-Jupiter conjunction, which Ibn Ezra has just proven is impossible to calculate.

⁷¹ This refers to the *deferent* and the *equant*, which were elements of ptolemaic cosmology. The deferent was the large orbit (the great wheel) of the planet around the Earth, and the equant was the centre of the deferent, which is situated some way off from the Earth for mathematical reasons (Lindberg 1992, 98-105).

⁷² "The small wheel" refers to the so called *epicycle* of the ptolemaic model, the smaller orbit of the planet around a point on its deferent. See previous note.

⁷³ The circle of the ecliptic was divided according to several systems, but Ibn Ezra favours the division into quadrants, where the quadrant between the ascendant and midheaven is called southern, and its opposite quadrant is northern, the quadrant between midheaven and the descendant is called western and its opposite is eastern. (Sefer ha-Te'amim 2007, 63; Reshit Hokhmah 1939, 191-192 on different ways to divide the ecliptic. On how the position in each quadrant affects the influences of the planets, see Sefer ha-Te'amim 2007, 89. The system of transits are derived from Abu Ma'shar 2000, part VI, see also Ptolemy 1940, 117-121, 161-163.

⁷⁴ Ibn Ezra consistently uses the word *toledet*, which normally means "generation", as "nature" (Sela 2003, 130-137).

⁷⁵ Ibn Ezra often uses the word *koach*, which means power, to denote the power that the stars have over earthly affairs (Sela 2003, 120).

⁷⁶ This sentence did not make sense, as it would contradict the statement in the previous passage. I have therefore added this note to make sense of it, as what he describes now is the opposite of what he described earlier.

⁷⁷ The *fardar* is an astrological period of 360, 78 or 75 years, of Persian origin. (See Tester 1987, 165-6.) Ibn Ezra mentions the *fardar* also many times in his other writings (Sefer ha-Te'amim 2007, 107, 178, 219, 225; Sefer ha-Moladot 2008, 76). In Sefer ha-Te'amim (2007, 107) Ibn Ezra promises to deal more fully with this subject in Sefer ha-Olam, a promise he fulfils here. See also section 3.3.1. of this study.

part, and in the rest of the seven parts⁷⁸ the planets will participate with her (the sun) when they are in this order: sun, Venus, Mercury, moon and Saturn, Jupiter, Mars⁷⁹. And after that, the moon will serve 9 years and then withdraw in the seventh part, and in the rest they will participate with it⁸⁰. After that, Caput Draconis three years and after that Jupiter 12, and after that Mercury 13, and after that Mercury 13⁸¹, and after that Saturn 11, and after that Cauda Draconis⁸² 2 years, and after that Mars 7 years and after that Venus 8 years. And the reason for these numbers of years I do not know, I only know the reason for this order, why it is such.

[148-153] It is because they began to give these parts according to the number of Aries, so that whoever is in its exaltation at the beginning will serve as the beginning⁸³. And the reason behind the (number of) years of Venus and Jupiter are known, since such is the number of their small years⁸⁴ because this is the number in which they will finally return to their (original) degrees (positions). If you wish to know (concerning) this year, which is the year (4)908⁸⁵, which (of the planets) is the ruler according to the calculation of the Persians, it is the fourth revolution of Mars. And each one will be alone in its seventh part (1/7) and the others will participate with it in the rest of the seventh part.

[153-164] And if one will argue⁸⁶ that (in that case) every 75 years would have to be alike, the following to the previous, because the planets and the partners (stars) are (only) two, then this is the answer: he should not count mathematically assuming the ascendant and the angle of the planets to it and the proportion of one to the other to be always the same, as if the world was always stationary. This matter you can observe since Saturn has many different ways of being in relation⁸⁷ to the sun and also in relation to the planets and also in proportion to the upper stars, and these (stars) are moving one degree every 70 years, and it will not have the relation that it had at the beginning to one of the upper stars, but only once in 25 000 years. And there is no need to go on about this, since the author of the *Sefer Yetzirah* already mentioned (that) “two stones build two houses, three stones six houses, four stones build twenty-four⁸⁸, and from ten upwards, go on and calculate that which the mouth cannot utter and the ear cannot hear”. Therefore one (can) not calculate a birth-chart (in its every detail) and one (birth-chart) cannot be compared to another birth-chart like it. Because the wheel is not fixed to one coordinate, but every moment the coordinate will change to a different one, and it will not be (the same any more), and the mathematicians know this⁸⁹.

⁷⁸ See Tester 1987, 168.

⁷⁹ This is the same order of the planets that Ibn Ezra gives in *Sefer ha-Te'amim* (2007, 49). Strangely this odd order is not the order of exaltation, as he says the fardar should be, but it is the one explicitly given by Abu Mashar (see Tester 1987, 166), clearly showing that Abu Ma'shar was Ibn Ezra's source for the fardar .

⁸⁰ The precise meaning of the word *hishtatef*, “participate”, in this context is unclear to me.

⁸¹ This is probably undue repetition.

⁸² Cauda and Caput Draconis are the Latin names for the lunar nodes. These are the two points where the paths of the sun and the moon around the earth intersect. Caput Draconis, the Head of the Dragon, is the ascending node, and Cauda Draconis, the Tail of the Dragon, is the descending node. These two points of intersection were treated as planets in Persian and Hindu astrology, for which Ibn Ezra criticizes them (*Sefer ha-Te'amim* 2007, 85).

⁸³ Tester explains (1987, 166): the first planet is the sun because it is exalted in Aries, the second is the moon, because it is exalted in Taurus, etc. This is however not the order given by Ibn Ezra, see note 36 above.

⁸⁴ Revolutions on the epicycle?

⁸⁵ The Hebrew gives only the number 908, but Sela translates this in *Sefer ha-Te'amim* (2007, 53) as being shorthand for 4908. Converted, this Hebrew year corresponds to 1147-1148 C.E. This conveniently dates our document.

⁸⁶ “The arguer argues”, see Sela's translation of *Sefer ha-Te'amim* (2007, 213, 247).

⁸⁷ Ibn Ezra uses the word *pe'ah* in many different ways in his texts. While *mip'at* generally means “because of”, I have here followed the context. See Sela's notes on *Sefer ha-Te'amim*, 2007, 123.

⁸⁸ $1 \times 2 = 2$, $1 \times 2 \times 3 = 6$, $1 \times 2 \times 3 \times 4 = 24$ etc. This kind of calculation is used in probability calculus. Ibn Ezra's point is that since the celestial bodies are so very numerous, and all are variable, the possible combinations in a birth-chart are vast beyond reckoning. He makes a similar point in *Yesod Morah* (1995, 173).

⁸⁹ The *Sefer Yetzirah* is a 3rd - 6th century anonymous Jewish mystical tract which forms one of the basic texts of Jewish mysticism, the *kabbalah*. *Sefer Yetzirah* 4:12 (transl. Aryeh Kaplan 1997) reads as follows: “The Seven Doubles, how does one permute them? Two stones build two houses, three build six houses, four build 24 houses, five build 120 houses, six build 720 houses, and seven build 5040 houses. From there on go out and calculate that which the mouth cannot speak and the ear cannot hear. These are the seven planets in the Universe: The sun, Venus, Mercury, the moon, Saturn, Jupiter, Mars”. Ibn Ezra makes a similar point in *Yesod Morah* (1995, 173).

[165-174] Masha'allah said (that) if you know a country's sign, observe in the revolution of the year of a conjunction (of Saturn and Jupiter) whether any planet is aspected to that sign, and how the ruler of that sign (is aspected). And as you see (them aspecting), judge according to it. Because if Mars or Saturn are in opposition or a quartile aspect to the nation ('s sign), and no benefic planet aspects the sign, or if the ruler of the sign is burned by the sun or the sign of the nation is in one of the cardines and it is (there) with Saturn or Mars, or (if the nation's sign is) in opposition or quartile aspect with them (Saturn or Mars), it indicates a great misfortune that will come to the nation, and even worse if the malefic is in the nation's sign. And (if) you find the ruler of the country's sign in the 8th house (death and inheritance) in respect to the nation's sign or in the 12th house (grief and animosity) or in the 6th house (diseases and servants⁹⁰), then they will die and fall into the hands of their enemies, and if a benefic was in the rising sign with a malefic planet, look at which of them has more power due to its (higher) position on the wheel and with regard to the ecliptic, as I have explained. And judge according to what you see.

[174-181] And know that Venus will deflect the injury of Mars in a conjunction or in aspect, so that Mars will appear injurious only in thoughts and words, but Venus does not have the power to deflect the injury of Saturn, only Jupiter, whether in conjunction or in aspect, deflects the injury of Saturn. And all that we have said, (is) in case Venus or Jupiter are not under the light of the sun, if (they are), they are not usable in this way. And Ptolemy has said that Jupiter cannot deflect the injury of Mars, despite its being higher (in rank) than it (Mars), because Jupiter with Saturn do not have (equal) rank (to Mars), only Venus is (of the same) rank. And make sure you do not forget to look every 30 years for a conjunction of Saturn with Mars in the sign of Cancer, which is the sign of the world⁹¹. And look (in) every nation ('s case) how the planets are positioned relative to the nation's sign.

[182-191] Ptolemy said (that) if a solar eclipse is calculated to occur a certain year, we should observe the moment of the eclipse and judge according to the ascendant. And if the solar eclipse is complete, then the judgement is certain. And we shall give judgement according to what the eclipse is like. And the truth of the matter is that the moment of the eclipse is in reality the moment of conjunction of the two luminaries. And this is not the case with the moments of the rest of the conjunctions. And so shall we judge (as in a conjunction). We shall observe the place of the conjunction, whether it is in one of the houses that have a human image⁹², (and if) there are benefic planets aspecting the sun and the moon as they are in conjunction, and (whether) they are in human-form signs, it indicates physical health for human beings, and peace and quiet among them. But if there are malefics in aspect with the luminaries, then the matter is the reverse. Illnesses and great bloodshed will be in the world. And if the conjunction occurred in one of the water-signs and malefics are aspecting them, there will be evils for all those whose nature is of water and (is susceptible to) tides. And judge like this if (the eclipse) is in Aries (it signifies) small cattle and if in Taurus (it signifies) large cattle and Leo (signifies) wild animals.

[192-207] Ptolemy said "If we wish to know the time when the majority of things that are significant, will be visible, but disappear immediately again, we have to look at the place of the solar or lunar eclipse, and we will see in which house it will be of the six houses that

⁹⁰ The indications of the houses that I have here added in brackets are taken from Reshit Hokhmah (1939, 192-193).

⁹¹ This is a reference to the so called *Thema Mundi*, the horoscope supposedly representing the creation of the world, where Cancer was the ascendant and the sun was in midheaven at the beginning of Aries. The *Thema Mundi* was familiar already to the Greeks. See Abu Ma'shar 2000, 23, 123-137; Burnett and Yamamoto 2000, 529-543; Sela 2007, 128; Tester 1987, 94, 119-120.

⁹² The signs with human-form constellation: Gemini, Libra, Virgo, half of Aquarius and Sagittarius. Animal-shaped signs indicate illness, human-shaped signs indicate health, according to Sefer ha-Te'amim 2.3:1 (2007, 41), see also Sela's notes 9-10 on page 277. Just as Ibn Ezra writes, the idea is derived from Ptolemy (1940, 171-173).

are above the earth (above the horizon) especially whether it is at the cusp of the first house, this will (mean) the beginning of the year, or in the descendant, (which will mean) the end of the year, or if at the cusp of the 10th house, (which will mean) the middle of the year. And this is the rule: we shall assign two months for every house, and it shall begin from the rising degree (and move) towards the last degree, and this is the opinion of Ptolemy⁹³. But the ancient scientists, and also the later ones, did not agree with him. Because (instead) in a solar eclipse we will take a whole year (to correspond) to every straight hour⁹⁴, and in accordance with the partitions of the hour (minutes) we shall take from the year (the minutes are to correspond with months etc.), and so (the duration) from the beginning on to the end are those that indicate about it (the year) until its end; according to the hours they are either benefic or opposite ones. And the major thing (the culmination of the event) is visible in the middle time⁹⁵ which is where the actual moment of the conjunction is, (that is) the one which was taken from the tables, not the conjunction which was observed. And at the eclipse of the moon they (the ancient and later scholars) will assign a month to every straight hour. I am inclined to agree with them, and know that Mercury, if it is in one of the malefics' houses, and if it and the malefics are close to the conjunction at the time of the lunar eclipse, (then) there is no malefic like it. The benefic planets in opposition (with Mercury) at the lunar eclipse are beneficial, from the conjunction on to the solar eclipse, and the malefics in opposition (with Mercury) become more injurious than they are at the conjunction, because at the conjunction they are burned by the sun.

[207-215] Doronius the king⁹⁶ said that he found in the Book of Secrets by Enoch⁹⁷ that he instructed that at the revolution of the year (in which occurs) a conjunction of Saturn and Jupiter, (whether it is) the Great Conjunction or the medium or the small one, to always observe the position of the planets at the beginning of the Aries ingress, and to see in which sign the influence of the *dodecatemoria*⁹⁸, from the malefic or the benefic planets falls⁹⁹. If, for example, we find Saturn in Taurus 14°, then we shall assign one sign to every 2,5 degrees¹⁰⁰, and we shall get five degrees and a degree and a half remains for us, and we assign 12 degrees for every degree, and thus is produced Libra 18°. Since Saturn is malefic, it signifies that evil will come to every nation whose sign is 18 from Libra, and (in this) degree, it will cause it injury, but if the nation has less than these degrees, harm will not befall it.

[215-222] And know that the influence of the *dodecatemoria* is stronger in the great conjunction than (it is) in the medium, and (stronger) in the medium than in the small one and (stronger) in the small one than in the revolution of every year. And if the influence of the *dodecatemoria* is assigned to a benefic planet, benefit will come to the nation¹⁰¹, and if

⁹³ Tetrabiblos 1940, 161, 165, 199. Sela (2003, 249) mentions this passage as an example of Ibn Ezra disagreeing with Ptolemy. Ibn Ezra lived in a time which was beginning to question and criticise Ptolemy's theories, which had been almost unquestioned for hundreds of years (See also Saliba 1994, 72-75).

⁹⁴ "Straight hour" is apparently equivalent to the "straight degree", which is a degree along the celestial equator, called elsewhere "equal degree".

⁹⁵ That is, the middle one of the three parts of the arc from ascendant to descendant, corresponding to the middle of the year in the system here described.

⁹⁶ Ibn Ezra refers to Dorotheus of Sidon as "king" because he sees him as the head of a certain astrological school of thought (Sela 2003, 65).

⁹⁷ Enoch was a character treated by Ibn Ezra as a prominent ancient Egyptian astronomer and astrologer, but was simultaneously an embodiment of the mythical Hermes, "author" of the Hermetic literature. The Biblical Enoch was the first out of three manifestations of Hermes. According to Ibn Ezra, he was an astrologer, and had astrologically predicted the Flood (Sela 2003, 185). See Pingree (1968, 15) on the Hermes-myth in Abu Ma'shar's work. The "Book of Secrets" that Ibn Ezra refers to is also found by Pingree in a manuscript called "Book of the Secrets of the Words of Hermes who is tripled in Wisdom" (Pingree 1994, 43).

⁹⁸ The *dodecatemoria* were small divisions of the circle, obtained by dividing a zodiacal sign (30°) into twelve parts (dodeca – Gr. "twelve"), thus producing 144 *dodecatemoria* of 2½° each. Each *dodecatemoria* was assigned a zodiacal sign in addition to the one in which the *dodecatemoria* was situated (Tester 1987, 27-29).

⁹⁹ Sela 2007, 134-135.

¹⁰⁰ 1/12 of 1/12 of the 360 degrees, thus 1/12 of a sign, and thus we will get 5 degrees. We get two signs when we count from Aries to Taurus.

¹⁰¹ Sela 2007, 135.

two influences join in the nation's sign; (being assigned) to (both) a malefic and to a benefic planet, (then) find out which one of them is dominant and has more visible power than the other. (If) the one of them is under the light of the sun it has no influence, and (if) that one which is in a falling house relative to the nation's sign, it also has no influence. (This is) also the case if that one is in the house of its dejection or detriment or it is retrograde. You must observe every year, especially the year of a conjunction (of Saturn and Jupiter), because (then) all that is indicated there is fortified¹⁰².

[222-235] And so, if you find the ruler of the nation's sign in the 7th house, it signifies that there will be wars against it (the nation), and especially if it is aspecting Mars. And if the ruler of the sign is one of the superior planets (Saturn or Jupiter), do not predict evil for the nation, but (only) that there will be a siege or a crisis, but not more, only if it is retrograde, then its power (of influence) will be weakened and the evil (befalling the nation) will (also) increase if it (the superior planet) is under the burning light. And if the ruler of the 7th house¹⁰³ is in the ascendant, judge that they (the nation) will defeat their enemies and especially so if it is one of the inferior planets. And if either the ruler of the nation's sign or the ruler of the 10th house is in question, look whether they are in conjunction or (whether) there is an aspect between them, and look which of them is more dominant, as I have mentioned in the Book of Elections¹⁰⁴. And judge accordingly, (that is) according to the aspects, because if there is between them a hostile aspect, which means quartile aspect or opposition, the wars between them¹⁰⁵ will be renewed, and if (there is) a friendly aspect (trine or sextile), there will be peace between them. But if one of the malefics is in one of the nation's cardines, it is a bad sign for the nation: and thus you shall judge that if it (the malefic) is in the ascendant (1st house), it indicates physical harm for the nation's people, and if in the 10th house (midheaven), it indicates evil befalling its king, and if in the 7th house (descendant), it indicates evil befalling the nation's people, but also to those who are warring against them. And if it is in the 4th house (lower midheaven) it indicates destruction of its fields and vineyards. And if there is a (benefic) planet in one of the cardines, predict good, and if malefics are with the benefics in the cardines, see which place is more powerful, and that power is to be more visible.

[236-240] In general, Enoch the Ancient said, Saturn indicates old people and farmers (field-workers) and Jupiter indicates judges and worshippers of the Lord and Mars (indicates) princes and warriors and the sun (indicates) kings and Venus (indicates) women and eunuchs, and Mercury (indicates) scholars and scribes and youths, and the moon (indicates) all people, and in accordance with its (the planet's) dominance or weakness in the revolution of the year, so will happen that (group) that it indicates.

[242-245] Enoch the Egyptian¹⁰⁶ said that the planet Jupiter with the sign of Aries indicates the land of Iraq and the kingdom of Persia. And Saturn with Libra indicates the land of Edom (Rome), and Mercury with Capricorn indicates the land of India, and Venus with Scorpio indicates Arabia and Mars with Leo indicates the land of Baragan¹⁰⁷ and the sun with Aquarius indicate the lands of Canaan and Greece and Egypt, and the moon with Virgo (indicates) the land of Khurasan¹⁰⁸. And in accordance with the planet and its power, and in accordance with the sign in the revolution of the year¹⁰⁹ (how the nation's planet and sign are situated), so shall the events of each of them be.

¹⁰² The great conjunction enhances all the influences.

¹⁰³ This apparently does not refer to the 7th astrological house in the system of houses relative to the ascendant, but merely to the seventh sign counting from the nation's sign, meaning the sign that is opposite to that sign.

¹⁰⁴ This refers to Ibn Ezra's *Sefer ha-Mivharim*, see the Introduction to this study.

¹⁰⁵ Two nations.

¹⁰⁶ Note the three different epithets for Enoch. See also section 3.3.4. of the present study.

¹⁰⁷ *Baragan* is a plain in Romania, by metonymy this may mean Byzantium. Abu Ma'shar lists these same locations in *On the Great Conjunctions*, and he includes Byzantium (Abu Ma'shar 2000, 515).

¹⁰⁸ *Khurasan* was a vast area in east Persia, today incorporating territories of Afghanistan, Turkmenistan and Tajikistan.

¹⁰⁹ How the nation's planet and sign are situated in the yearly horoscope cast at the Aries Ingress.

[246-253] These signs of the cities¹¹⁰ that we did not¹¹¹ know of ; Baghdad's sign is Cancer 21°, Egypt's is Taurus 5°, Almohadia's [?] Leo 3°, Avila's [?] Virgo 15°, Tunis' Virgo 4°, Palermo's Leo 1°, Rome's Leo 15°, Pisa's Aquarius 3°, Béziers' Pisces, Saragossa's Aries 6°, Almeria's Libra 20°, Valencia's Scorpio 6°, Cordoba's Gemini 22°, Seville's Pisces 7°, Granada's Cancer 10°, Messina's [?] Taurus 6°, the city of Jerusalem's Capricorn 6°, Buzayah's¹¹² Gemini 7°, and the city of Huesca's Taurus, Gabes' 2 degrees Pisces, and Kairouan's¹¹³ Cancer 15°. And this is how these are found written in a book¹¹⁴.

[254-266] You have to observe at any conjunction, whether great, medium or small, the position of Mars. Because if it is in the revolution (of the year) (in conjunction) with Saturn or Jupiter, or in opposition or in quartile aspect with them, then wars will break out again in the world, and they will occur when the sign in which the conjunction occurs arrives to the position of Mars. And I will give you an example. Let us say that, in the revolution of the year, Jupiter is at Taurus 10° and Saturn is at 13° and Mars is at Aries 26°, and the conjunction occurred in Taurus 14°. I will assign one year to every sign, and so in year 12 we bring the sign to the place of Mars, and we already said that it was at Aries 26° and so the beginning of the year starts at Aries 14°¹¹⁵. And we shall ask what the ratio of 12 and 30 is¹¹⁶, and it is 2/5. And thus after 2/5 (has passed) of year 12 of the small conjunction of Saturn and Jupiter, there will be great bloodshed in every country whose sign is Aries or one of the (other) cardinal signs. We also have to look at the revolution of the year in order to see the position of the planets and how they are aspected to the sign of Aries, which (corresponds to) the last house¹¹⁷, and this is how we shall judge according to whether they are benefic planets or malefic ones.

[266-269] All the astrologers say that the fire-signs and air-signs indicate prices going up and famine to occur in the world, and even more so when conjunctions occur in them, and earth-signs and water-signs indicate great satiety and low prices. One must also look at the revolution of every year, because if both Saturn and Jupiter are in the signs that indicate higher prices, this indicates prices going up, and the opposite is the case if they are in the other signs.

[270-278] Masha'allah has said (that) we shall always look at the beginning of each year for the position of the moon at the moment of separation from the conjunction or opposition with the sun, which of them will be at the beginning before the Aries ingress. If it is in conjunction with a malefic or is in a hostile aspect, it indicates evil for the world, and if benefic, it indicates good. And Saturn indicates illnesses and hatred without cause and quarrels and destruction of places and the sinking of ships. And Jupiter indicates peace and plenty of produce and quiet and security. And Mars indicates dissension, wars, plagues

¹¹⁰ Ibn Ezra writes in his commentary on Deut 4:19: "It has been established by experience that each and every nation has a specific star and constellation. Every city similarly has its own constellation" (C.Deut 2001, 24).

¹¹¹ It is unclear to me why Ibn Ezra here uses negation. Fleischer seems to share my confusion, as he has inserted an exclamation mark after the negation to indicate that he suspects copyist error.

¹¹² Fleischer's note says North Africa for this locality.

¹¹³ Gabes and Kairouan are both in what today is Tunisia.

¹¹⁴ These cities and localities are mostly situated around the Mediterranean. Since there are no cities in the Holy Land included, it seems that this list was pragmatic, offering the professional astrologer coordinates for making predictions for important trade-ports in the interest of merchant-customers. For Abu Ma'shar's list of correspondences, see 2000, 45. See also al-Kindi's list for comparison (Burnett and Yamamoto 2000, 529) and Ptolemy's (Ptolemy 1940, 161-163).

¹¹⁵ I do not know what he means here. The year should always begin at Aries 0°.

¹¹⁶ 30° in each sign, divided by 12 signs.

¹¹⁷ Usually Aries is said to correspond to the first house, but of course any sign can *coincide* with any house.

and migration between localities. And Venus indicates that appetites and pleasures increase in the world and especially in any place which is ruled by Venus or in whose sign Venus is (at that moment). And Mercury indicates scholarly inquiry and the success of scribes, the scholars and also of the merchants.

[279-290] Masha'allah has said to always in the (year of a) great conjunction, or the medium one or the small one, (and) also at the revolutions of each year, observe the ascendant at the moment of conjunction or opposition of the luminaries, for every nation, before the Aries ingress, because this a principle great importance! And observe the ruler of the ascendant at the moment of the conjunction or opposition, and the ascendant's ruler shall rule the place because it aspects it. Thus if we find the ruler in the 1st or in the 10th cardine¹¹⁸, it indicates increase in the prices of wheat in that region, and even more so if it (the ruler of the ascendant) is enhanced in its course, meaning that it will move faster than its mean motion, but if it moves slower than its mean motion¹¹⁹, or it is retrograde, which causes prices to go down day by day. And this is how to judge if it gives the power to the planet which is in one of the mentioned cardines. And if it was in one of the other cardines the case would be (of) medium (influence), and thus in the succedents and in the cadent (houses), prices will go down. And if the ruler is burned by the sun, damage will occur to the produce. And if it is in one of the cardines, then the damage will occur and if in the cadents, only a little will be (damaged), and thus you shall do year by year and month by month.

[291-295] Masha'allah has said (that) the place of the conjunction indicates olive oil, because that is tested. Therefore you have to observe the ruler of the place of the conjunction, and as you will see, so you shall judge, according to the judgment of the ruler of the produce (in the aforementioned case), and know that if the ruler is in its house of exaltation, the price of the product will go up, and less so if it was in its (own) house¹²⁰. And if it is in its house of dejection, it will get sufficient cheap, and if in its house of detriment¹²¹, it will be so, but not like the first¹²².

[296-311] Ya'qub al-Kindi has said in his Book of Revolution¹²³ (to) observe before the Aries ingress the sign of the conjunction or the opposition of the luminaries which is at the beginning (of the year) and if you find the ascendant (to be) of the water-signs, it indicates rain falling in (the time of) that same conjunction or the same opposition, and so also if the place of the conjunction or opposition was in one of the rising cardines¹²⁴ at that time, relative to the latitude of the country for which you are calculating the luminaries. And if the place of the conjunction or opposition is in one of the falling houses, judge that rain will not fall during the whole month, or during most of the same year. And if the rising sign is of the water-signs and the ruler of the sign aspects it, this is also complete proof of (heavy) rainfall. And if the ruler (of the rising sign) is there in the rising sign, then there will be (even) more (rain). And if the ruler is (in conjunction) with a luminary, then there will be very heavy rains (indeed), and if you wish to know the day when the rain will fall,

¹¹⁸ That is, the 1st or 10th houses, which coincide with the cardinal points ascendant and midheaven.

¹¹⁹ It appears to slow down and speed up again.

¹²⁰ Apparently Ibn Ezra is of the opinion that exaltation is stronger than domicile, and dejection is stronger than detriment.

¹²¹ A planet's dejection is the sign opposite the house of exaltation of that planet, detriment is the sign opposite the planets house or domicile. For details, see Sela 2007, 280.

¹²² Here Ibn Ezra begins to discuss "financial astrology". The prices of olive-oil and wheat would have been the corner-stones of the medieval economy, and were therefore naturally the object of intense efforts of prediction.

¹²³ *Abu Yusuf Yaqub ibn Ishaq al-Kindi*, ca 801–873, Islamic polymath, wrote on almost all kinds of science. He was the first Muslim peripatetic, and is particularly known for introducing Aristotelian thought into the Arab world. I have been unable to identify this "Book of Revolution".

¹²⁴ The ascendant or midheaven.

look to the day when the moon reaches the rising degree, and that is when the rains will come. And I, Abraham, say that if it is not so¹²⁵, there will be clouds and rain will not fall. And so said Plato in his book of Rain¹²⁶, and it is a tested matter. And know that the planets that are retrograde indicate showers; also the inferior ones that are under the sun and also if they are between inferiors and superiors in a feminine sign. And further clear proof is it if the sign is of the cold ones, whether of the earth-signs or of the water-signs. And the sign of Aquarius indicates water because of the stars that are called “pour out”¹²⁷, that are there. Also, the sign of Leo indicates water, because of the constellation of the ship¹²⁸ that is there¹²⁹.

[312-330] Abu Sarq¹³⁰ has said: “The ruler of the 7th house¹³¹ is always the superior planet's key.” And therefore Saturn's keys are the luminaries, because their houses are in opposition to its (Saturn's) houses¹³² like if the moon is in conjunction or is conferring its influence to Saturn in any conjunction or opposition that it (the moon) has with the sun. Know that in that same month (heavy) rains will fall and you can know the day that it will rain when you count the equal degrees between the place of the conjunction or opposition and the place where the aspect of Saturn is complete, and as the (same) number of days are completed, you shall assign one day for every degree, and that is when the rain will fall. Further clear evidence (is obtained) if by chance the moon is that same day in one of its phases¹³³, and these are the 12 keys of the moon¹³⁴. The first one is the moment of the conjunction with the sun equally [?], and the second is the separation from the sun, in equal degrees (it is) 12 degrees. And the third will be a separation of 45 degrees which is 1/8 of the wheel. And the fourth is a separation of 90 degrees, which is 1/4 of the wheel, and the fifth is a separation from the sun by 135 degrees, which is 3/4¹³⁵ of the wheel. And the sixth is a separation of 168 degrees from the sun, and the rule is that between it and the opposition of the sun, there are 12 degrees, and the eighth is a separation of 192 degrees from the sun, and the reason is that the separation is 12 degrees from the opposition to the sun¹³⁶. And the ninth is a separation of 225 degrees from the sun; its reason is that it is the separation from the sun by 3/8 of the wheel¹³⁷. And the tenth is a separation of 270 degrees from the sun, and its reason is that it is the separation from the sun by 1/4 of the wheel. And the eleventh key (phase) is separated from the sun by 315 degrees, and its reason is that it is the separation from the sun by half a quarter, which is 1/8. And the twelfth is separated from the sun by 348 degrees and its reason is that it is separated from the sun by

¹²⁵ It is unclear to me whether he means if the ruler is not with a luminary, or failing all above criteria.

¹²⁶ I have been unable to identify this work with certainty. There is, however, a text entitled “The Treatise of Humidity and Rain” by al-Kindi, which is included in at least one manuscript containing Ibn Ezra's astrological works (Levy & Cantera 1939, 17). Since al-Kindi is cited at the beginning of this passage, there may have been copyist confusion involved here.

¹²⁷ I have as yet not identified these stars.

¹²⁸ This refers to the ancient constellation *Argo Navis*.

¹²⁹ It is clear that in a warm Mediterranean climate, and indeed for all cultures living off agriculture, the amount of rain affected entire nations, and was therefore the object of mundane astrological prediction. It is good to bear in mind also that the entire science of meteorology was astrological at the time (see Forcada 1998 on meteorological books in al-Andalus).

¹³⁰ Despite the erroneous spelling in the Hebrew, this is apparently *Abu al-Saqr al-Qabisi Abd al-Aziz ibn Uthman*, who was a 10th century Arabic astrologer (d. 967). Known in Latin as *Alchabitius*, he is primarily known for his treatise on judicial astrology, *Introduction to the Art of Judgments of the Stars*, which was, in Latin translation, prized in medieval and Renaissance Europe.

¹³¹ This is apparently not a reference to the 7th house in the system of houses relative to the ascendant, but rather the 7th sign counting from the domicile of the superior planet, thereby being in opposition with it.

¹³² Saturn's domiciles are Aquarius and Capricorn. See Reshit Hokhmah 1998, 121: “Conferring of influence is when a planet is in its domicile, or exaltation, or triplicity, or bound, or face, and it is joining another planet or aspecting it, then it confers its power upon it.” Levy and Cantera call this “communication of influence” (Reshit Hokhmah 1939, 212).

¹³³ The Hebrew word *mafteah* means “key”, which in astrology usually refers to phases of the moon (Sela 383).

¹³⁴ This passage refers to the doctrine that the lunar phases are useful in predicting rain, see Sela 2007, 166. See also Abu Ma'shar 2000, 481 and part V.

¹³⁵ This seems to be a scribal error, this should surely be 3/8!

¹³⁶ 180+12=192.

¹³⁷ That is, counted in the opposite direction from 135.

12 degrees before it. These keys (phases) are tested by the ancients and (also) by later (scholars).

[330-342] Always observe if a planet is retrograde in the 1st house, indicating rain, because the planet in the first house is thought of as the power of the ruler of that house and (also) the ruler of the 7th, (thus) in the case of Jupiter (it is) Mercury (because their domiciles are opposite each other) and both indicate winds. Therefore look every month if the ruler of the ascendant is Jupiter or Mercury, and if one aspects the other or if they are in the cardines of one of the rising signs¹³⁸, then it indicates that winds will increase in the world. And all this is if the sign of the country is in one of the cardinal signs or they aspect the sign and if Venus or Mars is ruler of the ascendant and one aspects the other, and also if they are in one of the rising cardines, then they indicate rain in lightning and thunder and flames, and even more so if there is between them a quartile aspect or an aspect of hostility (opposition). And if one of them is in an earth-sign, then it indicates hails. You always have to observe Saturn in the revolution (of the year), for if it is in one of the earth-signs and no benefic planet aspects it, and if the moon is in a quartile aspect or in opposition with it, then it indicates great earth-quakes in the entire country where Saturn is in its own sign¹³⁹, or (one of) its sign(s) is in one of the cardines.

[342-350] And always observe Mars at the beginning of the year, especially if it is east of the sun and it has the rulership of the ascendant of the revolution of the year, (observe) which (sign) it rules, and whether it is in one of the rising cardines; then it indicates wars and bloodshed. And more so if it is in a sign with a human (-formed) constellation¹⁴⁰. And if it is in one of the fire-signs, it indicates that fires will burn in the country, and if the ruler of the sign of the country aspects a benefic sign in its place¹⁴¹, then the people of the country will be saved, and if (it is) not (aspecting a benefic), then (it will) not (be saved). And if it is occidental of the sun and is in a sign of a human (-formed) constellation, it indicates wars, yet there will be more fear than bloodshed. And earth-signs (with Mars) indicate ruin, and if it is at the beginning of the year in a cadent house or is retrograde, (then) the earth will fall silent from wars¹⁴².

[350-362] And always observe the position of the moon, because it indicates all mankind, so that if (the moon) is at the beginning (in conjunction) with a benefic (planet) or in a benefic aspect with one, it indicates physical health, and if (the moon) is with Saturn or in an aspect of opposition or quartile with it, and Saturn is in one of the deformed signs¹⁴³, which are Aries, Taurus, Cancer, Scorpio, Capricorn and Pisces, it indicates severe diseases and (different) kinds of inflammations¹⁴⁴ and coughs. And if Saturn is in one of the water-signs, it means great evil for those crossing the sea, and also if it is in the sign of Cancer. And the general (rule) is that it¹⁴⁵ causes injury to all who travel by water and the waters of the rivers will grow (flood) and spoil the crops if heavy rains come that harm (them), and Mars in the water-signs indicates destructive hailstones. And if Saturn or Mars are in Virgo or in Capricorn¹⁴⁶ or in air-signs, it indicates coming evil (in the form of) of locusts and (other) swarming insects in places that are suitable for them to be there¹⁴⁷. And if Mars or Saturn are in those signs which have human (-form) constellations, it indicates disputes and quarrels and wars, and if they are oriental, then it is visible¹⁴⁸ that they indicate more of (the same). And if one aspects the other with a quartile aspect or an opposition and Venus or Jupiter do not aspect, then it indicates great evil. And you can know the place where this

¹³⁸ The meaning of this sentence is odd, perhaps it should read "if they are in the cardines or one of them is in the ascendant".

¹³⁹ Capricorn or Aquarius.

¹⁴⁰ Gemini, Virgo, Libra, and half of Sagittarius and Aquarius.

¹⁴¹ Instead of Mars.

¹⁴² Cease from warring. This whole passage corresponds to Ptolemy 1940, 173.

¹⁴³ These are all the animal-shaped signs, with the exclusion of Leo. "Deformed" are all animal shaped signs except Leo, which together with Virgo are "strong signs"(Sela 2007, 278). This probably has seasonal reasons.

¹⁴⁴ This word can also mean "malaria".

¹⁴⁵ Saturn in water-signs or in Cancer specifically.

¹⁴⁶ Virgo and Capricorn are earth-signs.

¹⁴⁷ That is, where such swarms naturally occur.

¹⁴⁸ "Visible" may here mean "obvious".

will occur.

[362-372] Enoch the First¹⁴⁹ has said that Jupiter with the sign of Cancer indicates the country called al-Iraq, and already Abu Ma'shar mentioned that the sign of al-Iraq is the term of Jupiter¹⁵⁰ in the sign of Cancer which is 21 degrees of the sign (Cancer 21°). And it is a tested matter that every malefic planet which is in this degree or aspects it with an opposition or a quartile aspect at the beginning of the revolution of the year, harms the mentioned place (Iraq) and the opposite (is the case), if there (at Cancer 21°) is a benefic planet or an aspect with it. These (issues) have been tested endless times. And Saturn with Libra corresponds to the land of Rome, and it is the kingdom of Edom¹⁵¹. And Mercury with Capricorn is for the people of India, called "al-Hindi". On this (issue), Abu Ma'shar said that Mercury indicates their spirits, which is why they (the Hindus) are learned in wisdom, and Capricorn indicates their bodies, therefore they are not white (-skinned). And Venus in Scorpio is for al-Higaz¹⁵² where Mecca is. On this (matter), Abu Ma'shar said that every year that Scorpio aspects a malefic (at the revolution of the year), the king of the Kedar¹⁵³ and the ruler¹⁵⁴ of the Ishmaelite empire will die. And he mentioned several examples from his experience.

[373-376] Mars with Leo is Baragan¹⁵⁵, and the sun with Aquarius is the Land of Israel and Ionia (Greece) and Egypt. And the moon with Virgo is for the land of China and Khurasan¹⁵⁶. And the reason is that this is the same planet that is ruling them, and of the signs the mentioned sign. And when they are both in the revolution of the year, and also in the revolution of a year of a conjunction (of Saturn and Jupiter), judge accordingly, whether (for) good or evil.

[376-388] And in order to know the year of a drought, Masha'allah said (to) put great importance on the place where the great, medium or small conjunction (occurs), and such a year when the last house arrives at the place of Mars or Saturn, if its power over Jupiter will increase, like I mentioned in the beginning¹⁵⁷, it indicates a year of drought for every country in whose (sign) the last house arrives in. The meaning of the last house is that you assign one sign to every year, and you start from the sign of the conjunction from the (very) degree of the conjunction, counting up to 30 degrees and it (means) equal (degrees), which is a number that will cover one sign or two signs. And the important thing is that you count in equal degrees. Every year in which you arrive to¹⁵⁸ Venus or Mercury, if it is in a beneficent mixture, or to Jupiter if its power is increasing and it is dominating over Saturn in the beginning of the conjunction, it indicates abundance, especially in every country whose sign is one of the cardinal signs of (coinciding with) the last house¹⁵⁹. And al-Andruzgar the Israelite¹⁶⁰ said: "We shall always observe the Great Conjunction, which is the conjunction of Saturn and Jupiter (in Aries), and we shall assign one year to every equal degree, and we must start from the place of the conjunction and we must not make haste, whatever the time of year may be. And after 360 years, which is the number of degrees on

¹⁴⁹ See section 3.3.4. of this study.

¹⁵⁰ The Hebrew gives merely "Jupiter with Cancer" which makes no sense. However, the "astrological term" of Jupiter in Cancer makes good sense. Astrological "terms" are ancient divisions of 1/5 of a sign that were believed to correspond to the planets, in this case excluding the sun and the moon. (See Tester, 76-77). Ibn Ezra usually uses the word *gevul* for astrological term (Sela 2007, 390).

¹⁵¹ Edom is a common Hebrew word for Christendom, referring to the assumed descendants of the Biblical Esau, Jacob's brother.

¹⁵² The western region of the Arabian Peninsula.

¹⁵³ The Kedar were Arabian tribe, but later the name came to mean Arabs in general. See, however, note 17 on page 72.

¹⁵⁴ The Hebrew reads *molekh*, but the context clearly assumes a king. Abu Ma'shar speaks of the death of the king in connection with Scorpio (Abu Ma'shar 2000, 113).

¹⁵⁵ See note 107 above.

¹⁵⁶ See note 108 above.

¹⁵⁷ I have not found the passage that Ibn Ezra here refers to.

¹⁵⁸ That is, after the mentioned counting, it coincides with Venus or Mercury.

¹⁵⁹ This passage corresponds to Ibn Ezra's *Sefer ha-Moladot* (2008, 79). This technique is known as "progression". According to Tester, it was a debated technique, because it had its roots in magic. Ptolemy does not deal with progression. (Tester 1987, 87-88.)

¹⁶⁰ *Andruzgar ben Zadi Faruk*, a 9th century Persian Jewish astrologer. Very little is known of him.

the wheel, we shall return to look like (we did) at first”¹⁶¹.

[389-403] Abu Ma'shar said that today we are at the 7th degree of the sign of Libra, because according to the knowledge of the scholars of India they will assign 1000 years to every degree. Ya'qub al-Kindi said (to) observe the conjunction of the luminaries, or their opposition, which one of them is closer to the Aries ingress. And do not heed to the words of one who says that we shall always observe the entrance of the sun into Cancer 20(°), because from there on the waters of the wells begin to increase. If Venus was oriental¹⁶² at the beginning of the year, then the first half of the year will be better than the latter (part) and if it is occidental, the case is the opposite. And the correct (way to judge) is what I have said, that if one of the benefic planets is at the place of a conjunction or an opposition, then (that) one of them will have great dominance in the place, and (if) no malefic planet (is present there), it is the sign of a good year. And also if the benefic planet is in one of the cardines, (that is simultaneously) the rising sign which is (means) the ascendant, at the moment of the conjunction or the opposition, and according to the longitude of each country and according to the calculation of the houses that are cardines¹⁶³, because they will change according to the latitude of each country. And if the opposite is the case, that malefics are aspecting or they are in one of the cardinal signs that is (simultaneously) the rising sign¹⁶⁴, which is the ascendant, and no benefic planet is aspecting, (it is a sign of a) bad year. And if the benefics and malefics (both) are aspecting, observe which one has greater influence (and that is) the ruler. And know that a superior planet, if it is oriental and another superior is occidental, the greater influence is with the oriental (one). And if the inferior ones (are aspecting), the case is the opposite, because they are on the eastern horizon. And the one that is under the light of the sun has no influence at all, and similarly one that is retrograde.

[404-407] Abu Ma'shar, who tested these things many times, said that if Mars is at the Aries ingress in one of the houses of Saturn¹⁶⁵, it indicates drought, and if it is in one of its (own) houses, it indicates plenty of rain and (if) in the rest of the places, medium (moisture). And I do not know the reason for this. I also tried it, but I did not succeed, and I could not reach it. Therefore I mention it to you, so that if you find his book, do not rely on it. And none of the things (he said) about rain is (worth any) more than this¹⁶⁶.

[408-416] The scholars of India said that the lunar mansions are 28 (in number). And thus it will amount to 2 1/3 mansions for each sign¹⁶⁷. And thus it will be from the beginning of Aries which is its beginning¹⁶⁸ according to the knowledge of the scholars of the images¹⁶⁹, and 8° before the horns of Aries and they are at this degree at 22° from the beginning of

¹⁶¹ Ibn Ezra presents this same method for birth charts in *Sefer ha-Moladot* (2008, 79.) The period of 360 years is known as a *dawr*, an important astrological period used by Abu Ma'shar and other Muslim astrologers (see Burnett and Yamamoto 2000, 587-592).

¹⁶² A planet is oriental when it is east of the sun, and occidental when it is west of the sun.

¹⁶³ That is, the 1st, the 4th, the 7th and the 10th houses coincide with the cardinal points.

¹⁶⁴ Ibn Ezra here uses confusing terminology when he speaks of cardines, *yetadot*, meaning either cardinal signs: Aries, Cancer, Libra, Capricorn, and on the other hand the cardinal points of the horoscope; ascendant, midheaven, descendant, lower midheaven. On the other hand consider also the idea presented in *Sefer ha-Te'amim* 3.6:1 (2007,67) where Ibn Ezra says that the ascendant is determined by midheaven and lower midheaven.

¹⁶⁵ Saturn's domiciles are Aquarius and Capricorn.

¹⁶⁶ Again, this is critique aimed at Abu Ma'shar. It seems that Ibn Ezra was aware of the great popularity enjoyed by Abu Ma'shar's works in Ibn Ezra's time. He wanted to warn his readers not to trust these works blindly.

¹⁶⁷ $28/12=2\frac{1}{3}$.

¹⁶⁸ It is the beginning of the astrological year, hence of the counting of the mansions.

¹⁶⁹ The *hahkamei ha-tsurot* are elsewhere mentioned by Ibn Ezra as idolatrous star-worshippers (probably referring to Hindus and Persians), thus practising a forbidden form of astrology (*Sefer ha-Te'amim* 2007, 191; Sela 2007, 276).

Aries, which is (on) the (celestial) equator¹⁷⁰, that is, according to the division of the system¹⁷¹ and not according to the constellation, since the constellation Aries is small and (occupies) less than 1/4 of the sign. And thus, if you want to find the lunar mansion, subtract from the position of the moon the appropriate (amount), by using the tables of al-Battani: (subtract) 8° and then you find what you want (to know). From Aries, which is the constellation up to 13°, and it is also 51 parts¹⁷², it is the first mansion which is called al-Nath¹⁷³ and I already listed them for you¹⁷⁴, all the mansions, in their constellations, and their Arabic names and their explanations.

[417-430] The wise men of India have said that 10 mansions are moist and they indicate rain and torrents and these are their names in the Arabic language: al-Dabaran, al-Dhira, al-Gabhah, al-Sarfah, al-Ghabbar, al-Ikhlil, al-Shaula, al-Baldah¹⁷⁵, al-Fart and al-Mukar. And they say that as the moon's light becomes visible at the beginning of the month, if it is in one of the rain-mansions and a retrograde planet aspects it and especially if it is in a feminine sign and even more if it is in a water-sign, then it indicates rain. And (for) this, observe every month at the beginning of each month and even more at the beginning of the month which is before the Aries ingress, and also (the ingresses of) Cancer and Libra and Capricorn¹⁷⁶ and in general in one of the changeable signs. The reason is that the time of the Aries ingress is in opposition to that (place), because from the beginning of Aries to the head of Cancer it is a hot and humid time, and after that the time changes to its opposite so that the moist turns to dryness and the time from the beginning of Cancer to the end of Virgo is hot and dry. After that the time changes to its opposite (so as) to remove the heat and the cold comes after it, and times will be cold and dry, because one property¹⁷⁷ will remain as it is. And at the entrance of the sun into the sign of Capricorn, the dryness will stand aside and the cold will remain as it is, and times will be cold and moist, and so on always. And the dry mansions are al-Butain, al-Han'ah, al-Tarf, al-Qalb, Sad al-Ahbiya, al-Farch al-Muqdam¹⁷⁸. And the rest of the mansions are mixed (in their properties)¹⁷⁹.

[430-436] And now I will mention a rule. You always have to observe the 120 conjunctions which are conjunctions of the ministering planets and the luminaries. And after (what) you know from the book of the Beginning of Wisdom¹⁸⁰ (on) the mixture of every planet, so shall you judge and every thing that (each) planet indicates, and if it is strong because of the sun or because of the rising degree, or else on account of its ruler (being) in its (own) place; all that it indicates becomes significant. And it is the opposite of this if it is in the house of its dejection or the house of its detriment, and even more so if it is burned by the sun or is retrograde. And according to the benefic and malefic aspects of the planets shall

¹⁷⁰ Ibn Ezra uses the curious term *qav ha-tsedeg* for “equator” (Sela 2007, 381). The word thus has nothing to do with Jupiter (*Tsedeg*), as one would expect.

¹⁷¹ The Hebrew word is *machshevet*, evoking the meaning of a system of thought. What Ibn Ezra means is that the division of the ecliptic into 12 zodiacal signs is mathematical and conventional, as the borders of the signs are not existing things observable in the actual sky, but are based on convention. The actual constellations Aries, Taurus etc. do not follow even 30° sectors.

¹⁷² 13°51'.

¹⁷³ Al-Nath is the Arabic name for the first lunar mansion. There is a het in the Hebrew that seems to be misplaced, either because of Fleischer's or earlier copyists' error.

¹⁷⁴ I have been unable to determine where this list occurs, but it is probable that it is included in Ibn Ezra's *Sefer ha Ta'amei ha-Luchot*, a treatise explaining the reasons for the data in the astronomical tables, specifically those of *al-Khwarizmi* (ca 780-850, Iraqi mathematician. The algorithm is named after him).

¹⁷⁵ The Arabic names of the lunar mansions are available for instance in www.mazzaroth.com. Many of these coincide with major stars like Aldebaran (Alpha Taurii), Alderamin (Alpha Cephei), Algiega (Gamma Leonis), Rigel (Beta Orionis) etc.

¹⁷⁶ The cardinal signs.

¹⁷⁷ Cold, dry, hot or moist.

¹⁷⁸ See www.mazzaroth.com for the list. These coincide with stars like Botein (Delta Arietis) and Alhena (Gamma Geminorum).

¹⁷⁹ In this passage, Ibn Ezra introduced the lunar mansions, a doctrine based on a kind of lunar zodiac. The mansions or Stations, as they were also called, coincided with certain major stars along the moon's path. The important pre-Islamic Arabic meteorological system of *anwa* was based on these mansions. (See Forcada 1998.)

¹⁸⁰ This is a reference to *Reshit Hokhmah*, (transl. Levy and Cantera 1939, Epstein 1998), which is the first part of Ibn Ezra's astrological encyclopedia. See also the introduction to the present study.

you judge.

[436-442] I have also tested several times (that) the sun indicates Christians and Saturn (indicates) the Jews¹⁸¹ and Mars (indicates) Kedar¹⁸² and Venus (indicates) Muslims¹⁸³. And according to its (the planet's) influence at the beginning of the year, so shall you judge. And as I have said, Saturn indicates old people and slaves, and Jupiter men of wealth and judges, and Mars men of war and the sun craftsmen and Venus women and eunuchs and Mercury minors and scholars and scribes, and the moon indicates every human being. And every year that you find the moon in opposition to the sun or in quartile aspect (to it), it indicates a plot against the king in whatever country the moon is in, and the reason is that it is in its sign¹⁸⁴.

[443-452] Andruzgar has said (to) observe the ruler of the ascendant at the beginning of the revolution of the year, and the reason (for this) is (to find out) who is the ruler of the rising degree. If there are two or three trine (aspects) that aspect (the ruler of the ascendant), then you rely on these, and if several aspect (it), take the one that has more dominion in the rising degree and do the way you would do in a birth-chart¹⁸⁵. And if the ruler is (at present found to be) in the rising sign, it indicates joy and physical health for the people of that place. And if in the second (house), it indicates, if it is burned there, diseases and death and plagues, and if in the second (house) and in a good place, it indicates abundance for all the people of that place. If it is burned by the sun, it indicates that the (lesser) rulers are harming the appointed (king). And if in the third house, travellers (on the roads) will increase. And if in the fourth house, the seed will multiply. And if it is (in a) deformed (sign), judge the opposite. And if in house five, their children will increase, and if one of the malefics is there, the small boys will die. And in this way you shall judge in the rest of the houses, and always observe the aspects, because all judgments rest upon them.

*The Book of the World is completed
Praise be to the Creator of the World,
through which all books on judgments are completed.
The scholar Ben-Ezer¹⁸⁶ has finished them.*

¹⁸¹ The Hebrew word he uses here, *ha-pishtim*, means linens, which apparently evokes the tradition of *sha'atnez*, the prohibition of mixing linen with wool. The people associated with Saturn is certainly the Jews, according to what Ibn Ezra mentions in several other texts (C.Ex 32:1, 33:21; Sefer ha-Te'amim 2007, 71). See also Sela 2003, 291-292; 2007, 158; Zafran 1979 on the connection between Saturn and the Jews. Abu Ma'shar (2000, 44-45) presents the interesting view that the connection is related to the fact that Judaism is the oldest of the monotheistic religions and that the other ones confess to its validity while it confesses the validity of none of the others. It would have been very interesting to read what Ibn Ezra would have commented on this statement.

¹⁸² See note 17 on page 7.

¹⁸³ Ishmael was the son of the patriarch Abraham and Isaac's elder half-brother in the Biblical story. Both Muslims and Jews consider Muslims to be Ishmael's descendants.

¹⁸⁴ That is, the country in whose sign the moon is at the beginning of the year.

¹⁸⁵ See Sefer ha-Moladot 2008, 4-8.

¹⁸⁶ Ben-Ezer means "son of the Helper". This pun on his own name is typical of Ibn Ezra's style.

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