

# THE SUN'S PATH AT NIGHT

The Sixteenth-Century Transformation in  
Rabbinic Attitudes to the Talmud's Babylonian Cosmology



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Cover photograph: An armillary sphere, depicting the Ptolemaic model of the cosmos.

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## Introduction

The clash between reason and authority has many manifestations.<sup>1</sup> But it comes to the fore with the issue of statements by the Sages of the Talmud concerning the natural world that are subsequently contradicted by science. In traditionalist circles, arguments about this topic have become especially heated in recent years, with many ultra-Orthodox authorities claiming that to attribute such error to the Sages was *never* a traditional view and is actually heresy.

Typically, insight into this topic is obtained by surveying many different statements in the Talmud and Midrash, and their interpretation by rabbinic authorities over the ages. But there is one short passage in the Babylonian Talmud—a mere five lines in length—which brings the entire issue into sharp focus, since it describes the Sages themselves admitting error on their part. The Talmud describes a dispute between Jewish and gentile scholars relating to aspects of cosmology, and concludes with Judah the Patriarch conceding that the gentile scholars appear to be correct:

The Sages of Israel say, During the day, the sun travels below the firmament, and at night, above the firmament. And the scholars of the nations say, During the day the sun travels below the firmament, and at night below the ground. Rabbi said: Their words seem more correct than ours, for during the day the wellsprings are cool and at night they steam (due to being heated by the sun passing beneath them—Rashi). (*Pesahim* 94b)

Isadore Twersky notes that “the passage has a long history of interpretation, reflecting various moods: embarrassment, perplexity, satisfaction, with some attempts at harmonization or reinterpretation or restricting the significance of the report.”<sup>2</sup> Yet considering the importance of this topic to the broader issue of reason and authority, it is

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<sup>1</sup> An excellent discussion of this in a rabbinic context is Abraham Melamed, *On the Shoulders of Giants: The Debate between Moderns and Ancients in Medieval and Renaissance Jewish Thought* (Al Kitfei Anaqim: Toldot ha-pulmus bein aharonim lerishonim bahagut ha-yehudit biyemei ha-beinayim uvreishit ha-'et ha-hadashah), (Ramat-Gan, 2003).

<sup>2</sup> “Joseph Ibn Kaspi: Portrait of a Medieval Jewish Intellectual,” *Studies in Medieval Jewish History and Literature*, vol. 2 (Cambridge, MA, 1979), 256, note 52.

somewhat surprising that it has not yet been the subject of any systematic study. It is to fill this gap that this investigation was performed. When the views of rabbinic scholars throughout the centuries on this passage are surveyed, and placed in context, it powerfully illustrates the radical transformation that has taken place over the ages with regard to how Jews view the Sages of the Talmud—and it is a transformation which pivoted upon the sixteenth century.

## Chapter One: Babylonian Vs. Ptolemaic Cosmology

When thinking of revolutions in astronomy, it is usually the Copernican revolution that comes to mind, and that was indeed a topic of concern to many rabbis of the early modern period. But that was not the first revolution in astronomy. Many centuries earlier there was another dramatic transformation, in which the Babylonian cosmology, to which many of the Talmudic sages subscribed, was replaced by the Ptolemaic system.<sup>1</sup>

The Talmud consecutively relates two disputes between Jewish and gentile scholars concerning matters of astronomy. The first is with regard to the celestial sphere which encompasses the earth, and the constellations:

The Rabbis taught: The Sages of Israel say that the sphere is fixed and the constellations revolve [within it], and the scholars of the nations say that the sphere revolves [around the earth] and the constellations are fixed [within it]. (Talmud, *Pesahim* 94b)

As we shall later demonstrate from both general history as well as the interpretations of the medieval rabbinic scholars, the view of the Sages of Israel was that of ancient Babylonian cosmology.<sup>2</sup> They believed that the earth is a roughly flat disc,<sup>3</sup> and the rest of the universe is a hemispherical solid dome fixed above it. The stars move around the surface of this dome; hence, “the [hemi]sphere is fixed and the constellations revolve [within it].”

The opposing view, of the gentile astronomers, was that presented by Aristotle and refined by Ptolemy in his *Almagest*. In this view, the earth is a perfect sphere, and the rest of

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<sup>1</sup> Whether this can be termed a “revolution” is debatable; see Nicholas Campion, “Was There A Ptolemaic Revolution in Ancient Egyptian Astronomy? Souls, Stars & Cosmology,” *Journal of Cosmology* 13 (Feb.-Mar. 2011): 4174-86; Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought* (Cambridge, MA, 1957) 108-10; and H. Floris Cohen, *The Scientific Revolution: A Historiographical Enquiry* (Chicago, IL, 1994), 21-22.

<sup>2</sup> See Wolfgang Heimpel, “The Sun at Night and the Doors of Heaven in Babylonian Texts,” *Journal of Cuneiform Studies* 38 (1986): 127-51, and Moshe Simon-Shoshan, “The Heavens Proclaim the Glory of God—A Study in Rabbinic Cosmology,” *Bekhol Derakheka Daehu* 20 (2008): 67-96.

<sup>3</sup> More precisely, they believed it to be slightly raised at the center, with the Land of Israel at the apex, and Jerusalem at the very center of the apex (Babylonian Talmud, *Kiddushin* 69a and *Sanhedrin* 87a; Midrash *Sifri*, *Ekev* 1). See too the statement of the Babylonian Talmud, *Shabbat* 65b, regarding rainfall in the Land of Israel resulting in a rise in the Euphrates (and see the comments of Rashi and Tosafot ad loc.).

the universe is a larger sphere<sup>4</sup> which encompasses it and revolves around it. The stars are permanently embedded in the surface of the larger sphere, and move along with it; hence, “the sphere revolves and the constellations are fixed.”

The Talmud then cites a debate involving Rebbi (Judah the Patriarch) and Aha bar Yaakov:

Rebbi said: A response to their words is that we have never found the Great Bear constellation in the south and the Scorpion constellation in the north. Rav Aha bar Jacob objected: But perhaps it is like the axle of a millstone, or the hinges of a door socket. (Talmud, *Pesahim* 94b)

An explanation of this somewhat cryptic passage can be deduced from a near-identical set of arguments found in the writings of Cosmas Indicopleustes of Alexandria, a sixth-century monk. Cosmas, in a polemic against those who believed in a spherical earth,<sup>5</sup> presents the same argument used by Judah the Patriarch and pre-emptively Aha bar Jacob's counter-argument:

But you will most effectually rebuke them if you say: Why does that [celestial] sphere of yours not revolve from the north to the south, or from some other quarter to its opposite? ...But if, again, it rolls and rotates always in the same spot without moving from place to place, then it must be upheld by supports like a turner's lathe, or an artificial globe, or on an axle like a machine or a wagon. And if so, then we must again inquire by what the supports and axles are themselves upheld, and so on *ad infinitum*... When these problems then concerning the nature of things are discussed, there remains the conclusion, as we said before, that the heaven is fixed and does not revolve. (*Christian Topography*, part I, pp. 119-120<sup>6</sup>)

Cosmas Indicopleustes uses the same terminology as the Talmud. Like Judah the Patriarch, he argues that if the universe was a celestial sphere revolving around the earth, in which the constellations are embedded, then the constellations should move all over the place, and yet some constellations are always found in the north, and others always in the south. He notes that there is a counter-argument—in the Talmud, voiced by Aha bar Jacob—that the sphere has a north-south axis around which the rotation takes place, but

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<sup>4</sup> In fact, the model involved a series of larger spheres.

<sup>5</sup> Cosmas was not the only figure to engage in such battles. In the fourth century, Lactantius, a Christian advisor to Emperor Constantine, included in his *Divine Institutes* a chapter ridiculing the notion of a spherical earth (Book III Chapter XXIV).

<sup>6</sup> Page numbers from Montfaucon's edition, *Nova Collectio Patrum et Scriptorum Graecorum*, reprinted in the 88th volume of the *Patrologia Graeca*, ed. J.P. Migne, (Paris, 1864). Translation by J. W. McCrindle, (London, 1897).



argues that this axis itself would require support. With identical arguments being used, we can see that the context of the dispute between the Jewish and gentile scholars was a broader dispute between the ancient Babylonian cosmology and the newer Ptolemaic model.

The Talmud immediately continues to relate another difference of opinion between the Sages and the gentile astronomers:

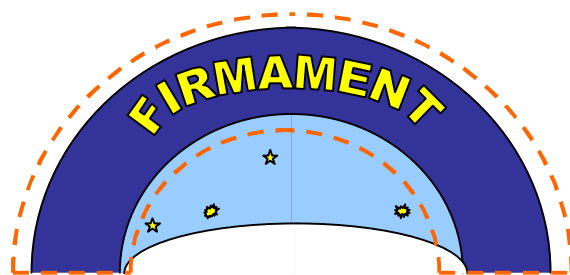
The Sages of Israel say, During the day, the sun travels below the firmament, and at night, above the firmament. And the scholars of the nations say, During the day the sun travels below the firmament, and at night below the ground. Rabbi said: Their words seem more correct than ours, for during the day the wellsprings are cool and at night they steam (due to being heated by the sun passing beneath them—Rashi). (Talmud, *ibid.*)

This is a corollary of the first dispute. Consistent with the ancient Babylonian cosmology, the Sages believed that when the sun sets, it cannot continue downwards, and it must instead change direction. First it enters the firmament horizontally, and then after passing through the firmament, it changes direction again, rising up to pass behind the firmament back to the east. The gentile astronomers, on the other hand, knew that the world is spherical and that the universe (or “celestial sphere,” in their model) surrounds it on all sides, and thus the sun can make a full orbit around the earth. This time, instead of disputing the view of the astronomers, Judah the Patriarch acknowledges that their description appears correct, since it would account for the mist rising up in the morning from natural bodies of water; he believed this mist to be steam caused by the sun heating the water from beneath.

There are some variations in this text between different manuscripts of the Talmud, some of which we shall later discuss.<sup>7</sup> However, these need not concern us here; in any case, the text in our version of the Talmud is consistent with the arguments appearing in non-Jewish works of the period, as well as being more coherent than the variant texts, and thus appears to be the most accurate. By conceding to the astronomers, Judah the Patriarch was accepting a significant aspect of the Ptolemaic system, which, while in error concerning geocentricity, was vastly closer to reality than the Babylonian system. His intellectual honesty is all the more striking in light of the fact that in the first dispute, he presented an argument to bolster the Babylonian cosmology.

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<sup>7</sup> Menahem Kasher discusses the variant texts in “The Form of the Earth and its Relationship to the Sun in the Works of Chazal and the Rishonim” (Hebrew) *Talpiyot* 1-2 (Sivan 5705): 155-76. We shall later discuss Kasher’s conclusions.



*The dotted line depicts the path of the sun, according to the view of the Jewish sages.*

The ancient Babylonian cosmology held by the Sages appears in many places in the Talmud,<sup>8</sup> such as in the following discussion:

It was taught in a Beraita: Rabbi Eliezer says, the world is like an exedra, and the northern side is not enclosed, and when the sun reaches the north-western corner, it bends back and rises above the firmament. And Rabbi Joshua says, the world is like a tent, and the northern side is enclosed, and when the sun reaches the north-western corner, it circles around and returns on the other side of the dome, as it says, “traveling to the south, and circling to the north...” (Eccl. 1:6)—traveling to the south by day, and circling to the north by night—“it continually passes around, and the wind returns again to its circuits” (ibid.)—this refers to the eastern and western sides, which the sun sometimes passes around and sometimes traverses. (*Bava Batra* 25a-b)

Rabbi Eliezer is presenting the view attributed in *Pesahim* to the Sages of Israel,<sup>9</sup> while Rabbi Joshua is presenting a variant in which at night the sun moves horizontally along the inner side of the northern edge of the celestial dome.<sup>10</sup> This is consistent with how others present this ancient cosmology. Severianus, Bishop of Gabala (d. 408), wrote that the earth

<sup>8</sup> See Azariah de Rossi, *Me'or Einayim, Imrei Binah* 1:11 (Mantua, 1573-75) pp. 55b-57b; Menahem Kasher, “*Shabbat Bereshit VeShabbat Har Sinai*,” *Talpiyot* 3-4: 636-39; Gad ben-Ami Tzarfati, “Talmudic Cosmography,” (Hebrew) *Tarbitz* 35 (1966): 137-48, and Moshe Simon-Shoshan, “The Heavens Proclaim the Glory of God—A Study in Rabbinic Cosmology.” There are also certain statements in the Talmud and Midrashim, such as Jerusalem Talmud, *Avodah Zarah* 18b, regarding Alexander rising above the world and seeing it as a ball, that *may* indicate that *some* Sages realized the earth to be spherical, but the correct interpretation of such texts is unclear.

<sup>9</sup> As Azariah de Rossi (loc. cit.) points out, this is also consistent with numerous statements of his in *Pirkei d'Rebbi Eliezer*.

<sup>10</sup> Gad ben-Ami Tzarfati, “Three Notes on the Words of the Tanna'im,” p. 141. Cf. Samuel Edeles to *Bava Batra* 25b and also to *Bava Batra* 74b, s.v. “*Amar leih ma'or gadol ra'iti*,” who writes that Rabbi Eliezer follows the Sages of Israel and Rabbi Joshua follows the gentiles.

is flat and the sun does not pass under it in the night, but travels through the northern parts “as if hidden by a wall.”<sup>11</sup> The same view is stated by Cosmas Indicopleustes:

These things being so we shall say, agreeably to what we find in divine scripture, that the sun issuing from the east traverses the sky in the south and ascends northwards, and becomes visible to the whole of the inhabited world. But as the northern and western summit intervenes it produces night in the ocean beyond this earth of ours, and also in the earth beyond the ocean; then afterwards when the sun is in the west, where he is hidden by the highest portion of the earth, and runs his course over the ocean through the northern parts, his presence there makes it night for us, until in describing his orbit he comes again to the east, and again ascending the southern sky illumines the inhabited world, as the divine scripture says through the divine Solomon: “The sun riseth and the sun goeth down and hasteth to his own place. Rising there, he goeth to the south, and wheeleth his circuit, and the wind turneth round to his circuits.” (*Christian Topography*, part II, p. 134)

In the Midrash, the dispute appears with some of the Sages following the Babylonian cosmology with regard to the path of the sun, others having adopted the Ptolemaic cosmology, and still others believing that the sun changes its path at different times of the year:

How do the orbs of the sun and moon set? R. Judah b. R. La'i and the rabbis [disagree]. R. Judah says, behind the dome and above it. The rabbis say, behind the dome and below it. R. Yonatan said: The words of R. Judah b. R. La'i appear [correct] in the summer, when the entire world is hot and the wellsprings are cool, and the words of the rabbis, that it sets below the dome in the winter, when the whole world is cold and the wellsprings are warm. R. Simeon b. Jochai said: We do not know if they fly up in the air, if they scrape the firmament, or if they travel as usual; the matter is exceedingly difficult and it is impossible for humans to determine. (*Midrash Bereshit Rabbah* 6:8)

The Jerusalem Talmud also mentions 365 different windows in the firmament through which the sun enters the sky.<sup>12</sup> This view is reflected in the prayerbook, where it describes God as “piercing windows in the firmament, taking the sun out from its place.”<sup>13</sup>

## Summary of Chapter Two

There are a variety of texts in the Talmud and Midrash which demonstrate the Sages to have subscribed to the ancient Babylonian cosmology. In the text that is central to our

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<sup>11</sup> Reference from John L. Dreyer, *A History of Planetary Systems* (Cambridge, MA, 1906) , 211.

<sup>12</sup> Jerusalem Talmud, *Rosh HaShanah* 2:5 (58a). See Daniel Sperber, *Magic and Folklore in Rabbinic Literature* (Tel Aviv, 1994), 206.

<sup>13</sup> *Siddur Rinat Yisrael* (Jerusalem, 2008), Sabbath morning prayers, 250.

study, there are two disputes between the Sages and the gentile astronomers, both of which relate to differences between the ancient Babylonian cosmology and that of Aristotle and Ptolemy. The text concludes with Judah the Patriarch conceding to the gentiles.

## Chapter Two: The Medieval Background

In order to appreciate the revolutionary nature of the approaches to this topic initiated by sixteenth-century rabbinic authorities, we must contrast it with the previous approaches from the medieval period. The first reference to this topic is found in an anonymous responsum from the Geonic period.

[With regard to the dispute regarding the stars and spheres], this matter is not part of the laws relating to property, nor to capital offenses, and nor to ritual purity and impurity, such that a ruling would have to be determined. Nevertheless, it seems that even though Rabbi said that a response to their words is that we have never found the Great Bear constellation in the south and the Scorpion constellation in the north, and thus the sphere is fixed and the constellations revolve—it is apparent that Rabbah (in our text: Rav Aha bar Jacob) refuted Rabbi... And it is an established principle that the law is always in accordance with the later view. And furthermore, the Talmud in *HaMokher Et HaSefinah*<sup>1</sup> supports Rabbah... And likewise, the gentile scholars say that during the day, the sun travels below the firmament etc., and in that case, the law follows the gentile scholars, as Rabbi said, “Their words appear more correct than ours, for by days the wells are cool, and at night they steam,”—and nobody disputes Rabbi in this. And furthermore, we ourselves see that the wells are just as Rabbi described. (*Otzar HaGeonim* (Jerusalem 1931) *Pesahim*, p. 88)

The Geonic author sees the resolution of the dispute as being of little importance, due to the lack of *halakhic* ramifications. Nevertheless, he points to a range of reasons to believe that the gentile scholars were correct, and does not evince any distress at this.<sup>2</sup> Sherira Gaon and Hai Gaon are likewise cited in later texts as stating that the view about the sun travelling through the firmament is incorrect and must be rejected.<sup>3</sup>

Maimonides (1135-1204) was not only unconcerned with the Sages being incorrect; he valued this passage as setting a useful precedent for other cases:

One of the ancient opinions that are widespread among the philosophers and the general run of people consists in the belief that the motion of the spheres produces very fearful and

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<sup>1</sup> Babylonian Talmud, *Bava Batra* 74a, which refers to the sphere moving.

<sup>2</sup> Y. Tzvi Langermann, “Hebrew Astronomy: Deep Soundings from a Rich Tradition,” in *Astronomy Across Cultures: the History of Non-Western Astronomy*, ed. Helaine Selin, (Dordrecht, 2000), 557.

<sup>3</sup> See Moses Alashkar, *Responsa* (Sabbionetta, 1554), #96, pp. 155a-157a.

mighty sounds... This opinion also is generally known in our religious community. Do you not see that the Sages describe the might of the sound produced by the sun when it every day proceeds on its way in the sphere?... Aristotle, however, does not accept this and makes it clear that the heavenly bodies produce no sound... You should not find it blameworthy that the opinion of Aristotle disagrees with that of the Sages, may their memory be blessed, as to this point. For this opinion, I mean to say the one according to which the heavenly bodies produce sounds, is consequent upon the belief in a fixed sphere and in stars that return. You know, on the other hand, that in these astronomical matters they preferred the opinion of the sages of the nations of the world to their own. For they explicitly say: The sages of the nations of the world have vanquished. And this is correct. For everyone who argues in speculative matters does this according to the conclusions to which he was led by his speculation. Hence the conclusion whose demonstration is correct is believed. (*Guide for the Perplexed* 2:8, translated by Shlomo Pines (Chicago, 1963), p. 33)

In Maimonides' reference to the Talmud, there are two apparent points of divergence from our version of the Talmud. The first is that Maimonides claims that the text explicitly states that the gentiles "vanquished" (*nitzhu*) them. In our text, however, Judah the Patriarch only says that *venir'in divreihen midvarenu*, "their words appear more [correct] than ours."<sup>4</sup> One suggestion is that Maimonides was paraphrasing the text according to his understanding of it (or from memory).<sup>5</sup> However, as we shall see, Jacob b. Meir quoted the same version as Maimonides, and thus it appears that there was a legitimate alternate text of the Talmud in circulation at that time.<sup>6</sup>

The second point of divergence is that Maimonides apparently cites Judah the Patriarch's verdict in reference to the first dispute in the Talmud, concerning the sphere and the constellations, instead of with regard to the second dispute, concerning sun's path at night. In our text, Judah the Patriarch did not endorse the gentile scholars' position in the first dispute; instead, he challenged it. As we shall see, a number of other authorities

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<sup>4</sup> As we shall see, there were later rabbinic figures such as Joseph Ashkenazi who interpreted the word "appear" to mean that Judah the Patriarch only accepted that the gentile scholars had presented superior arguments for their position, but not that they were ultimately correct. Ironically, however, Jacob b. Meir, who (like Ashkenazi) also believed that the Sages of Israel were actually correct and that the gentile astronomers had only presented superior arguments, quoted the Talmud with the same terminology as did Maimonides.

<sup>5</sup> Azariah de Rossi, *Me'or Einayim, Imrei Binah* 1:11.

<sup>6</sup> Sid Z. Leiman, cited by Joanna Weinberg, *The Light of the Eyes* (New Haven, CT, 2001), 204-5, note 20.

also recorded the gentiles as having triumphed in the first dispute, concerning the spheres and constellations.<sup>7</sup>

Some suggest that Maimonides was working with a different text of the Talmud, in which Judah the Patriarch conceded to the gentile scholars in the first dispute.<sup>8</sup> However, this approach is not confirmed by any manuscript evidence.

Another approach is possible. A careful reading shows that Maimonides refers to the gentiles being correct in “such matters” of astronomy. Maimonides may have meant that in the same way as Judah the Patriarch concedes that the gentiles were correct with regard to the sun’s path at night, it has likewise since become clear that they were correct in the former dispute, too.

Yet another possibility emerges from the discussion by Maimonides’ son Abraham (1186-1237). He notes, as we did, that the view of the Jewish scholars that the sun passes behind the firmament at night is linked to the view that the sphere is fixed and the constellations revolve in it—both are different aspects of the ancient Babylonian cosmology. Accordingly, when Judah the Patriarch conceded that the gentiles were correct regarding the sun’s path at night, this meant that they also must have been correct regarding the sphere revolving and the stars being fixed in it.

Maimonides was the paradigmatic rationalist, and his approach to this topic is consistent with rationalism. His son Abraham famously cites this story to prove that the Sages of the Talmud did not possess a Divine source of knowledge for their statements about the natural world, and cites Judah the Patriarch’s concession to the non-Jewish scholars as an example of intellectual honesty.<sup>9</sup> Maimonides’ disciple Samuel ibn Tibbon notes that the Sages’ error is unsurprising in light of the fact that astronomy in the Talmudic era was greatly deficient, and adds that even in his day there are many unresolved questions in astronomy.<sup>10</sup> The thirteenth-century Provençal rationalist Isaac b. Yedaiah notes that unlike the sages of the Land of Israel, who were flawless experts in astronomy and knew full well that the stars are embedded in the sphere(!), the Jewish sages of Babylon accepted that they were deficient in this knowledge and thus engaged in discussion and

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<sup>7</sup> Samuel Ibn Tibbon was the first to raise this difficulty; see *Ma’amar Yikavu Ha-Mayim* (Pressburg, 1837), p. 52; see Carlos Fraenkel, *From Rambam to Samuel ibn Tibbon: The Transformation of the Dalalat al Ha’irin into the Moreh ha-Nevukhim* (Jerusalem, 2007), 220-22.

<sup>8</sup> Moses Maimonides, *The Guide for the Perplexed*, ed. Solomon Munk (Paris, 1856), vol. II p. 79 note 1.

<sup>9</sup> Abraham Maimonides, *Ma’amar Al Derashot Hazal, Milhamot Hashem*, ed. R. Margalioth (Jerusalem, 1953): 83-84.

<sup>10</sup> *Yikavu HaMayim* (Pressburg, 1837), 52.

debate with the gentiles, unashamed to be vanquished.<sup>11</sup> Both Bahya b. Asher (d. 1340)<sup>12</sup> and Menahem b. Aharon ibn Zerah (Spain, d. 1385)<sup>13</sup> note that the Sages conceded to the gentiles that the stars are fixed in the spheres.

But it is not only Spanish rationalists who accepted that Judah the Patriarch rejected the view of the Sages. This acceptance was widespread, for two reasons. One was that it was the clear and straightforward meaning of the Talmud. Another was that for medieval scholars of Islamic lands, educated in astronomy, Ptolemaic cosmology was considered established fact; it was thus self-evident that the Sages had been mistaken in thinking that the sphere was fixed and the sun passes behind the firmament at night.

We thus find many medieval scholars mentioning that the Sages' views had been rejected. The Tosafist Eliezer b. Samuel of Metz (1115-1198) suggests that the reason why one must knead matzah dough only with water that had sat the night after being drawn is to prevent it from being heated during the night by the sun, which is passing beneath the earth at that time. He notes that this follows the view of the gentile scholars, which Judah the Patriarch had concluded to appear correct.<sup>14</sup> Eliezer b. Samuel's view is quoted, endorsed and further explained by Asher ben Jehiel (Germany/Spain, 1250-1328),<sup>15</sup> notwithstanding his position that the critical speculations of secular wisdoms have no place within tradition-based Judaism, as well as by Yeruham b. Meshullam (France/Spain, 1280-1350),<sup>16</sup> Moses b. Jacob (Coucy, France, 13th century),<sup>17</sup> and Yom Tov b. Abraham Asevilli (Spain, 1250-1330).<sup>18</sup> Manohah b. Jacob (Provence, 13th-14th century) likewise states that one must use drawn water that has stood overnight because of Judah the Patriarch's concession that the sun passes beneath the world at night.<sup>19</sup>

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<sup>11</sup> See Marc Saperstein, *Decoding the Rabbis: A Thirteenth-Century Commentary on the Aggadah* (Cambridge, MA, 1980), 23-24.

<sup>12</sup> *Commentary to the Torah* (Warsaw, 1879), Genesis 1:14, p. 12.

<sup>13</sup> *Tzedah la-Derekh* (Warsaw, 1880), part I, ch. 25, p. 17a.

<sup>14</sup> Eliezer of Metz, *Sefer Yere'im* (Warsaw, 1931), vol. I, section 2 - *akhilot*, #52, p. 22. See Abraham Abba's commentary *To'afot Re'em* for an important correction to the text of *Sefer Yere'im*. On the other hand, in section 7, *Mehalelei Shabbat* #274 (numbered in some editions as #102), p. 302, he does adopt the view that the luminaries pass behind the firmament.

<sup>15</sup> Rosh, *Pesahim* 2:30 and *Responsa*, (Jerusalem, 1994), *Kelal* 14, #2, p. 71.

<sup>16</sup> *Toldot Adam Ve-Havah* (Istanbul, 1516), *Netiv* 5, Part 3, p. 41b. However, in *Netiv* 12, Part 1, p. 65a, he approvingly cites Jacob b. Meir's view that the Sages were actually correct.

<sup>17</sup> *Sefer Mitzvot Ha-Gadol* (Venice 1547), *Mitzvot Lo Ta'aseh* #79, p. 31a. Note that in *Mitzvot Asei* #32 he endorses the view of Jacob b. Meir, which, as we shall later note, relates to the position that the Sages were actually correct. However, it seems that that connection was not made by Moses b. Jacob.

<sup>18</sup> *Commentary on the Haggadah*, s.v. *Matzah zo she'anu okhlim* (Warsaw, 1876), p. 25b.

<sup>19</sup> *Sefer Ha-Menuha* (Pressburg, 1879), Laws of *Hametz* and *Matzah* 5:11, s.v. *Ela bemayim shelanu*, p. 23b.



Todros ben Joseph Abulafia (Spain, ca.1225-ca.1285) was a rabbinic leader in Castille and a kabbalist. In arguing how the esoteric knowledge traditionally known as *sod ha-ibbur* (lit. “the secret of intercalation”) could not refer to astronomy, he points out that gentile astronomers were more accomplished in this field than the Sages, as evinced by their triumphing over the Sages with regard to the spheres and constellations. In a particularly sharp comment, Abulafia adds that “anyone who has tasted even a little knowledge knows that there is not a fool in the world [today] who believes that the sphere is stationary.”<sup>20</sup> Isaiah di Trani (Italy, 1180-1250) observes that the view of the gentile scholars is the main (“*ikkar*”) view.<sup>21</sup>

We see that it was widely accepted that this topic demonstrated the Sages of the Talmud to be fallible regarding the natural sciences. But it should be noted that the fact of scholars in Ashkenaz acknowledging that the Sages were in error does not necessarily indicate that they had rationalistic leanings away from the idea of the superiority of the ancients, or a grasp and acceptance of Ptolemaic cosmology. Rather, it may well have more to do with their reverence for the Talmud in its straightforward meaning. It is the simple, straightforward meaning of the Talmud that there was a dispute regarding the physical reality and that Judah the Patriarch preferred the view of the non-Jewish scholars. The Ashkenaz scholars may well have reasoned that if the great Judah the Patriarch said that the Sages of Israel were incorrect, who are they to disagree? Still, if they would have considered it entirely unthinkable for any of the Sages to have been in error, no doubt they would have found a way to say so, as indeed did many later figures.

There was one medieval scholar who did find a way to say so. In contrast to all the other medieval scholars, Jacob b. Meir (“Rabbeinu Tam,” c. 1100–c. 1171) is cited in a report by Betzalel Ashkenazi as follows:

And likewise I have heard in the name of Jacob b. Meir, of blessed memory, that he would say regarding that which is said in the chapter *Mi Shehaya Tamei* that the Sages of Israel said that the sphere is fixed and the constellations revolve within it... and it is said there, “Judah the Patriarch said, A response to their words etc...” And Jacob b. Meir said, that even though the gentile scholars were victorious over the Sages of Israel, that is a victory in arguments, but the truth is in accordance with the Sages of Israel, and that is what we say in prayer, “Who pierces the windows of the firmament” (*Shitah Mekubetzet* (Jerusalem, 1952) to *Ketuvot* 13b, s.v. *mai ka-amar lehu*, p. 126)

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<sup>20</sup> Sefer HaKavod to Ketubot 111a, printed in Leon A. Feldman, “Otzar HaKavod HaShalem lemasekhet Ketubot leRabbeinu Todrus HaLevi Abulafia miTolitul,” Sefer HaYovel leKavod Shalom Baron, vol. 3 (Jerusalem, 1984), 309-10.

<sup>21</sup> *Tosafot Rid*, ed. Moses Reinhold (Levov, 1862), *Shabbat* 34b, s.v. *Eizehu* (no page numbers printed).

In Jacob b. Meir's writings elsewhere, this view relates to a contradiction between two statements in the Talmud by Judah which give differing definitions of the duration from sunset to nightfall. Jacob b. Meir resolves this contradiction by explaining that there are two stages of sunset. The first takes place when the sun stops moving downwards and instead moves horizontally to enter the firmament via a window. The second occurs when it has completed its journey through the four-*mil* thickness of the firmament and begins to move up and around behind it.<sup>22</sup> This view has important *halakhic* consequences for the time at which the Sabbath is considered to depart.

But the question to be addressed is what motivated Jacob b. Meir to adopt this approach. Many later figures motivated by conservative traditionalism took the position that the Sages of the Talmud *must* have been correct, due to their great wisdom. But this was apparently not the basis for the position of Jacob b. Meir himself. For if Jacob b. Meir was of the view that the Sages were such infallible geniuses, then how could it be proposed that they were not able to provide adequate arguments for their position, especially since (according to Jacob b. Meir) they had physical reality on their side!

One might suggest that what motivated Jacob b. Meir was simply harmonizing disparate texts (regarding differing definitions of the duration from sunset to nightfall), in the standard manner of Tosafists.<sup>23</sup> However, it does not seem plausible that he could have done so had he been aware of the power of the Ptolemaic model. It seems that Jacob b. Meir's understanding of cosmology enabled him to believe the Sages to have been correct in their statement—that is to say, that he still maintained the ancient Babylonian view of the universe and had never been taught the Ptolemaic model.<sup>24</sup> Accordingly, in Jacob b. Meir's view, it is not that the Sages *must* have been correct in their dispute with the gentiles, but rather that they *happened* to have been correct, even though they did not know why.

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<sup>22</sup> *Tosafot* to *Pesahim* 94a, s.v. Rabbi Yehudah; Jacob ben Meir, *Sefer HaYashar*, ed. S. Schlesinger (Jerusalem, 1959), *Helek Ha-Hiddushim* #221, *Shabbat* 34b, p. 139. See too Solomon ibn Adret's discussion of Jacob b. Meir's view in *Hidushei HaRashba*, *Shabbat* 34b, and also Abraham de Boton, *Lehem Mishneh*, in Maimonides, *Mishneh Torah*, Vol. II - *Zemanim* (Warsaw 1882), Laws of Sabbath 5:4, p. 22.

<sup>23</sup> Y. Tzvi Langermann, "Hebrew Astronomy: Deep Soundings from a Rich Tradition," in *Astronomy Across Cultures: The History of Non-Western Astronomy*, ed. Helaine Selin, (Dordrecht, 2000), 565. For discussion of the general approach of the Tosafists in harmonizing disparate texts, see Israel M. Ta-Shma, *Creativity and Tradition: Studies in Medieval Rabbinic Scholarship, Literature and Thought* (Cambridge, MA, 2006), p. 88.

<sup>24</sup> Incidentally, as David Judah Leib Silverstein points out in *Shevilei David* (Jerusalem, 1862), *Orah Haim* no. 455, p. 96b, Jacob b. Meir's grandfather Rashi also appears to have maintained the Babylonian cosmology; see Rashi's comments to *Ta'anit* 25b, s.v. *Bein Tehoma*.

It may seem remarkable that as late as the twelfth century, Jacob b. Meir was still maintaining a view of the sun passing behind the sky at night, which suggests that he fully subscribed to Babylonian cosmology, including a flat earth. This attests to the lack of schooling in science by the Jews of northern France, who were evidently unaware of the Ptolemaic model that was standard elsewhere. This was not a uniquely Jewish phenomenon; Christian Europe itself was only just beginning to absorb the new astronomy from Islamic scholars.<sup>25</sup> Discoveries take time to be accepted, and obsolete theories can survive in the face of overwhelming evidence to the contrary; Ptolemaic cosmology would in turn be taught in the universities long after it had been discredited.

More surprising is that even Nahmanides approvingly cites Jacob b. Meir's view.<sup>26</sup> The wonder of this is only partially mitigated by noting that, despite his rationalistic leanings and studies of philosophy, Nahmanides' formative education was under the Tosafists, and he had no training in the sciences.<sup>27</sup> But this would not account for how Nissim of Gerona, who was not only educated in Spain but was even an astronomer, also adopts Jacob b. Meir's model.<sup>28</sup> It is true that a number of medieval and later authorities adopted Jacob b. Meir's view regarding the existence of two stages of sunset, and many early modern scholars noted that this did not mean that they believed the Sages to have been correct regarding the sun's path at night.<sup>29</sup> However, it is more difficult to say this with authorities such as Nahmanides and Nissim of Gerona, who explicitly described Jacob b. Meir's view as involving the sun passing behind the firmament.

### Summary of Chapter Three

In general, the Geonim and medieval rabbinic scholars followed the straightforward reading of the Talmud, according to which Judah the Patriarch conceded that the view of the gentile astronomers appeared to be correct. A notable exception was Jacob b. Meir, who

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<sup>25</sup> Frank Durham and Robert D. Purrington, *Frame of the Universe: A History of Physical Cosmology* (New York, NY, 1983), 77-78.

<sup>26</sup> *Kitvei HaRamban*, ed. C. Chavel (Jerusalem, 1963), vol. II, *Torat Ha-Adam*, p. 251. Cf. his commentary to Gen. 1:5 (ed. M. Chavel, Jerusalem, 1959), p. 18, where he demonstrates awareness of the Ptolemaic model.

<sup>27</sup> Y. Tzvi Langermann, "Torah and Science: Five Approaches from Medieval Spain," in José Luiz Goldfarb & Márcia M. H. Ferraz, eds., *Anais do VII Seminário Nacional de História da Ciência e da Tecnologia* (São Paulo, 2000), 36.

<sup>28</sup> Hiddushei HaRan to Alfasi, Shabbat 34b.

<sup>29</sup> See, for example, David ben Solomon ibn Zimra, *She'eilot U'Teshuvot Radbaz* (Jerusalem, 1882), Part IV, #282, p. 150; Hezekiah da Silva, *Kuntrus Binah Ve'Da'at* (also known as *Kuntrus D'vei Shamsha*, Krakow, 1927), p. 5b-6a; Abraham Cohen Pimentel, *Minhat Kohan* (Amsterdam, 1668), *Sefer Mevo HaShemesh* 1:4, pp. 10b-12a.

argued that the concession was only with regard to gentiles being able to better argue their position, but that the Babylonian cosmology of the Sages was nevertheless correct. However, it seems that Jacob b. Meir was motivated by considerations other than a refusal to accept any shortcomings on the part of the Sages.

## Chapter Three: Sixteenth-Century Revolutions

In the sixteenth century, and even beyond, there were still those who accepted the straightforward reading of the Talmud, without showing any signs of concern. Abraham Menahem Rapa Porto (Italy, 1520-1596) interprets the Scriptural account of God placing the luminaries in the firmament as being consistent with the view of the gentiles that the stars are fixed in the spheres, and he notes that the Sages conceded to the gentiles regarding this point.<sup>1</sup> Abraham b. Moses de Boton (Greece, 1545-1585), in referring to the dispute concerning the sun's path at night, describes the gentiles as having triumphed (*nitzhu*) over the Sages, using the stronger terminology that appears in Maimonides' *Guide*.<sup>2</sup> He also notes that the view of the gentiles is confirmed and points out (following Eliezer of Metz) that the Sages themselves ended up establishing certain laws based on the view of the gentiles,<sup>3</sup> and he rejects Jacob b. Meir's view that the Sages were actually correct. Samuel Eliezer Edels (Poland, 1555-1631) also describes the Sages as having conceded to the gentiles regarding the sun's path at night.<sup>4</sup> Abraham Cohen Pimentel (Amsterdam, d.1697) points out that the view that sun goes behind the sky at night is simply not true and can be proven false.<sup>5</sup>

Moses ben Isaac Alashkar (Egypt, 1456-1542), discusses the view of Jacob b. Meir concerning there being two parts of sunset (which we shall soon explore), which is based on the belief that the Sages were actually correct in saying that the sun passes behind the sky at night. He observes that the Geonim, Maimonides and numerous other medieval scholars accepted the view of the gentiles, as did Judah the Patriarch himself, and he brings further

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<sup>1</sup> *Minha Belula* (Verona, 1594), Bereshit 1:17, p. 3b.

<sup>2</sup> *Lehem Mishneh to Mishneh Torah* (Warsaw 1882), Laws of Sabbath 5:4, p. 22.

<sup>3</sup> Namely, the law that matzah may only be kneaded using *mayim shelanu*—water that has been drawn and stood overnight. This was because only cool water may be used, and it was believed that well water is heated at night by the sun passing beneath it, following the view of the gentiles that the sun passes beneath the earth at night.

<sup>4</sup> *Hidushei Aggadot to Bava Batra 25b*, s.v. *Rabbi Eliezer Omer*. Note that in *Ta'anit* 9b he describes a dispute between the sages regarding the source of rain, for which each side brings Scriptural proofs, as “hinging on the views of the scientists, according to the opinions of the philosophers.”

<sup>5</sup> *Minhat Kohen* (Amsterdam, 1668), *Sefer Mevo HaShemesh* 1:4, pp. 10b-12a, discussing how Jacob b. Meir's view concerning sunset is not viable.

scientific proofs for its veracity.<sup>6</sup> David ben Solomon ibn Zimra (Spain-Egypt-Safed, 1479-1573) describes the Sages as having recanted and conceded to the gentiles.<sup>7</sup> Elijah Mizrahi (Constantinople, 1450-1526), in arguing that it is permissible to teach science to non-Jews, brings evidence for his position from the dispute between the Sages and the gentile astronomers regarding the sun's path at night, which indicates that there was a discussion between them on such matters; and he notes in passing that Judah the Patriarch decided that the view of the gentiles appears more correct.<sup>8</sup> Even such a dedicated kabbalist as Moses Cordovero (Safed 1522-1570), describes the Sages as having recanted and conceded to the gentile astronomers.<sup>9</sup>

Still more positive towards this passage of the Talmud was Azariah de Rossi (Italy, 1513-1578). Citing Maimonides and elaborating further, he utilized this passage as a foundation for his position that the Sages were fallible in such matters of science; de Rossi describes at length how many passages in the Talmud and Midrash reflect an obsolete cosmology, as well as other empirical errors.<sup>10</sup>

But it is in the sixteenth century<sup>11</sup> that we first find those who are greatly uncomfortable with this passage in the Talmud. Five distinct novel categories of response emerge in this period:

- (I) Reluctant acceptance of the Talmud in its plain meaning, with apologetic explanations of how the Sages could have been incorrect and/or suggestions that the matter has not been definitively resolved;
- (II) Reinterpretation of certain terms such that the Sages were not saying anything inaccurate;
- (III) Reframing the entire discussion as referring to mystical concepts rather than astronomy;
- (IV) Ignoring the general errors in the cosmology of the Sages and focusing upon one aspect in which they were vindicated;

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<sup>6</sup> Moses Alashkar, *Responsa* (Sabbionetta, 1554), #96, pp. 155a-157a.

<sup>7</sup> David ben Solomon ibn Zimra, *Responsa* (Jerusalem, 1882), Part IV, #282, pp. 148-9.

<sup>8</sup> Eliyahu Mizrahi, *Responsa* (Jerusalem, 1938) #57, pp. 177-8.

<sup>9</sup> *Pardes Rimonim* (Karetz, 1780) 6:3, p. 30. He takes it in reference to the dispute concerning whether the sphere or the constellations are fixed.

<sup>10</sup> *Me'or Einayim* (Mantua, 1573-75), *Imrei Binah* 1:11 pp. 55b-57b.

<sup>11</sup> Note that, borrowing a well-accepted idea first proposed by Fernand Braudel, I am referring here to the "long" sixteenth century, beginning with Isaac Arama (1420-1494) and Isaac Abarbanel (1437-1508), and concluding with Joseph Delmedigo (1591-1655).

(V) Flat-out denying that the Sages could have been mistaken.

We shall explore these categories in turn, showing how various figures adopted each of these approaches.

### I. Arama and Abarbanel: Apologetic Acceptance

Isaac Arama (Spain 1420-1494) describes the non-Jewish scholars as having triumphed (*nitzhu*) over the Jewish sages, using the stronger terminology that appears in Maimonides' *Guide*, and also refers to the Jewish sages as having conceded to the non-Jewish scholars. While understanding Judah the Patriarch's statement as referring to the first dispute regarding whether the sphere or the constellations are fixed, he makes some important comments about why he believes the non-Jews to be superior in their knowledge of astronomy:

This truth was discovered first by the gentile scholars and their kingdoms because of their immense efforts in pursuing this study [of astronomy], which they concentrated on in order to serve [the heavenly bodies]... in the foreign ways of their religions, which the Torah forbade; while the Jewish sages did not need to know [all this astronomy]—except as it related to the intercalation of months and the timing of the seasons and the new moons, necessary for the Torah and [its] commandments.... The rest they considered foreign and a waste of time—foreign matters that they were never permitted to study.... (*Akeidat Yitzhak* (Lvov 1868), *Parashat Bo*, Chap. 37, p. 46a)

Arama accepts that the Sages had an incorrect view, but in contrast to all his predecessors, he provides an explanation for this error that serves to prevent the Sages from being cast in a negative light in any way. His explanation even serves to elevate the Sages, arguing that their error was the result of such studies being beneath them.

Don Isaac Abarbanel (Portugal 1437-1508) was influenced by a wide range of cultures, and his attitude to this topic is far from absolute.<sup>12</sup> He cites Maimonides' conclusion that the gentiles disproved the Sages' view that the constellations possess independent motion. Abarbanel presents an explanation as to how the Sages took their position due to a particular astronomical theory of Pliny and Plotinus that was prevalent in their day, so as to avoid people thinking that the Sages arrived at their view due to intellectual shortcomings.<sup>13</sup> (Note that by positing that the Sages could be excused in light of the information at their

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<sup>12</sup> See Eric Lawee, *Isaac Abarbanel's Stance toward Tradition* (Albany, NY, 2001).

<sup>13</sup> Commentary to Genesis, (Jerusalem, 1964) p. 57. For discussion, see Andre Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century: David Gans (1541-1613) and His Times* (New York, NY, 1986), 220-22.

disposal, Abarbanel demonstrates his Renaissance humanist awareness of the significance of historical context.)

Initially it appears that Abarbanel is not disagreeing with Maimonides' conclusion that the Sages were wrong in this belief. But later he states that, although he personally prefers the Ptolemaic view and is adopting it in his commentary, the matter is still not definitively resolved; he quotes Simeon b. Jochai from the Midrash that the Sages themselves knew that such questions are impossible to answer with certainty. This reveals Abarbanel's discomfort in attributing error to the Sages, as does his explanation as to how, if indeed their view was incorrect, they arrived at it due to following Pliny and Plotinus. His approach here is consistent with his lengthy apologetic discussion elsewhere regarding how to relate to statements by the Sages which appear to be contradicted by science. In that discussion, Abarbanel invokes the notions of their being divinely inspired, and of nature having changed; and he adds that we should not attribute seeming scientific errors to any deficiency on their part, but rather we should realize that if we were to have known their premises, we would see how their conclusions follow correctly.<sup>14</sup>

All this clearly reveals Abarbanel's discomfort with the idea of the Sages being in error. As Lawee notes, Abarbanel's fidelity to the past "was notably self-conscious"<sup>15</sup>; he was only too aware of the vast challenges raised to traditional views, and saw himself as a defender of that tradition. As such, whereas earlier figures were not overly concerned with the Sages conceding victory to the gentile astronomers, Abarbanel had to reign in that concession and limit its significance.

## II. Moses Isserles and Menahem Azariah da Fano: Textual Reinterpretation

Moses Isserles (1520-1572, Poland) studied astronomy extensively—Fishman rates him as the "founding father" of a major trend of rabbinic study of astronomy in Poland<sup>16</sup>—although his sources of information were restricted to Hebrew translations of scientific works and he showed no awareness of recent developments such as Copernican theory. Isserles discusses the topic of the Sages' alleged astronomical errors in his *Torat Ha-Olah*, an explanation of how the Temple and its artifacts correspond to structures in divine and natural philosophy. Early in this work,<sup>17</sup> he describes how the seven parts of the Temple correlate to the "seven climates" (a Greek division of the inhabited part of the earth into

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<sup>14</sup> *Yeshu'ot Meshiho* (Karlsruhe, 1828), part II, introduction, p. 9b.

<sup>15</sup> Lawee, loc cit., p. 206.

<sup>16</sup> David E. Fishman, "Rabbi Moshe Isserles and the Study of Science Among Polish Rabbis," *Science in Context* 10:4 (December 1997), 571-88.

<sup>17</sup> *Torat Ha-Olah* (Prague, 1570), 1:2, p. 6b.



seven longitudinal bands, each of which covers an area in which all parts share the same feature, such as the weather or the length of a summer day<sup>18</sup>). Through a complex calculation involving numerology which converts linear distances into words, he argues that the eight-cubit area between the northernmost wall of the Temple courtyard and the butchering area symbolizes the “power of God” in “closing the world” at its northern edge. At this point, Isserles says that he will diverge to discussing statements by the Sages that the world is open on its northern side.

As noted earlier, the Talmud (*Bava Batra* 25a) presents the view of Rabbi Eliezer that the world (lit. *olam*, and thus referring to the surface of the universe, i.e. the firmament<sup>19</sup>) is open on the northern side. The sun exits through this opening when it sets, in order to travel above the firmament back to the east:

It was taught in a Beraita: Rabbi Eliezer says, the world is like an exedra, and the northern side is not enclosed, and when the sun reaches the north-western corner, it bends back and rises above the firmament. And Rabbi Joshua says, the world is like a tent, and the northern side is enclosed, and when the sun reaches the north-western corner, it circles around and returns on the other side of the dome, as it says, “traveling to the south, and circling to the north...” (Eccl. 1:6)—traveling to the south by day, and circling to the north by night—“it continually passes around, and the wind returns again to its circuits” (ibid.)—this refers to the eastern and western sides, which the sun sometimes passes around and sometimes traverses. (*Bava Batra* 25a-b)

Isserles also cites various other Talmudic and Midrashic allusions to the world being open on one side. These sources present a great difficulty: Isserles objects that it is known and uncontested that the world is surrounded on all sides by the spheres, so how could the Talmud state that it is open on one side? He continues to note that even Rabbi Joshua, who he (mistakenly) understands as presenting the correct Ptolemaic model in which the spheres are solid and unbroken, describes the sun as travelling in the south by day and in the north at night, which is contrary to the reality of it travelling from east to west. Isserles concludes the question and introduces his solution with the following:

And should someone say that the words of the Sages, of blessed memory, are an accepted tradition—and it is possible that such is the case—I shall not dispute him, for if they are an accepted tradition, we shall accept them, even though they are far from the intellect. But if it is up for evaluation, there is a rejoinder; and if there is any possibility of explaining the words of the Sages, may their memory be for a blessing, in such a way that they do not

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<sup>18</sup> See Shlomo Sela, *Abraham Ibn Ezra and the Rise of Medieval Hebrew Science* (Leiden, 2003), 107.

<sup>19</sup> The word *olam* is sometimes translated as “world” and sometimes as “universe,” but in the Babylonian cosmology, in which all celestial bodies were contained in a dome over a flat earth, they were identical.

differ from that which is well known, and to bring them in line with the intellect, how good and pleasant would that be.

Seemingly oblivious to the fact that the Talmud is operating within the Babylonian cosmology, Isserles proceeds to argue that the Talmud's description of the world being open on its northern side is referring to the line tracing the sun's path around the earth, which would be invisible, i.e. "open," on the northern side (since the line passes below the horizon at that part). His justification for claiming that the word *olam* refers to the orbital path of the sun (in the Talmud's statement that the world is open on its northern side) is that the existence of the world fundamentally depends on the existence of the sun! He also notes that according to all this, Rabbi Eliezer and Rabbi Joshua are not arguing at all; rather, one is describing the visible portion of the sun's orbital path, while the other is describing the entire orbital path. As regards Rabbi Eliezer's statement that the sun rises above the firmament at night, Isserles refers us to his later discussion, where he explains that the word *rakia* can refer to the land, which is spread out (*roka*) over the water, and thus Rabbi Eliezer is simply referring to the sun still being above the earth in places beyond the horizon.<sup>20</sup> Returning to his original launching point for this discussion, about the power of God being displayed in the "closing of the world" at its northern edge, Isserles explains that the "closing of the world" refers to the continuation of this path beneath the horizon, and it demonstrates God's power in that it shows how He forces the sun to set.

After these extraordinarily forced apologetics, Isserles notes:

And behold, I say that the words of our Sages, may their memories be for a blessing, are all built upon the true wisdom, and their words contain nothing perverse or crooked—even though sometimes, at first thought, it seems that they do not accord with the words of the scholars which are developed via proofs, especially in the field of astronomy. And some scholars (in disputing the Sages) support themselves with that which they said that "the gentile scholars triumphed over the Sages of Israel"; this is also with the words of the Master, the Guide, who wrote that "the science of astronomy was not fully developed in the days of the prophets and the early sages." But one who investigates this will be shocked to say that the Sages, may their memories be for a blessing, did not know these matters! A person who is concerned for the honor of his Creator and the honor of the Sages of the Torah will not think thus, but rather will be meticulous with their words.

As a final demonstration of the scientific wisdom of the Sages, Isserles cites the Midrash that we mentioned earlier:

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<sup>20</sup> See *Torat Ha-Olah* 3:27, p. 94a, where Isserles insists that the *rakia* of Genesis 1:6 refers to the earth while that mentioned in other verses refers to the heavens.

How do the orbs of the sun and moon set? Rabbi Judah b. R. La'i and the rabbis [disagree]. Rabbi Judah says, behind the dome and above it. The rabbis say, behind the dome and below it. Rabbi Jonathan said: The words of Rabbi Judah b. R. La'i appear [correct] in the summer, when the entire world is hot and the wellsprings are cool, and the words of the rabbis, that it sets below the dome in the winter, when the whole world is cold and the wellsprings are warm. Rabbi Simeon b. Jochai said: We do not know if they fly up in the air, if they scrape the firmament, or if they travel as usual; the matter is exceedingly difficult and it is impossible for humans to determine. (*Midrash Bereshit Rabbah* 6:8)

Isserles presents yet another forced explanation, via which Rabbi Judah, the Rabbis, and Rabbi Jonathan are all agreeing and presenting a correct scientific view about the path of the sun which has nothing to do with it travelling above the firmament. He concludes by noting that Rabbi Simeon b. Johai is describing an intractable problem in astronomy, which is a conflict between three models of the universe: that of Ptolemy, in which the stars are fixed in the spheres; that of the Sages, in which the spheres are fixed and the stars move; and another model proposed by al-Bitruji and described by Isaac Israeli in *Yesod Olam*.<sup>21</sup> But in order to argue that the Sages' model remains a viable possibility despite their concession to the gentile scholars, Isserles has to explain that this concession was not as it appears:

Even though they said that “the gentile scholars were victorious etc.,” I have already written in my commentary to the *Megillah*<sup>22</sup> and *Sefer Aggadot* that they did not mean to say that the Sages of Israel retracted, but rather that due to the reasons of exile, they forgot that approach, and they did not know how to calculate all the ways of astronomy via that system, and they were forced to study via the gentiles' astronomical system. And this is the concept of their “concession,” just as I have proved with clear proofs in the aforementioned works. (*Torat Ha-Olah* 1:2)

In his commentary to the *Megillah*, entitled *Mehir Yayin*, Isserles rates the Sages' view that the sphere is fixed and the constellations revolve as being a position originally espoused by the prophet Ezekiel.<sup>23</sup> This is based on Maimonides in *Guide* II:8, where the idea of the spheres producing sounds is explained to be predicated upon the belief that the stars move around the spheres, making noise as they bore through them.<sup>24</sup> Accordingly, Isserles

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<sup>21</sup> See Bernard Goldstein, *Al-Bitruji: On the Principles of Astronomy* (New Haven, CT, 1971).

<sup>22</sup> *Mehir Yayin* (Jerusalem, 1926), Esther 2:5, pp. 36-7.

<sup>23</sup> The myth that all true scientific knowledge originated with the Jewish prophets is discussed by Abraham Melamed, *Al Kifei Anakim*, p. 34.

<sup>24</sup> According to Maimonides later in the *Guide*, this means that Ezekiel 1:24 is speaking of such a phenomenon. The commentators to the *Guide* thus observe that Maimonides himself was thus of the view that Ezekiel's prophecy was packaged in a mistaken scientific worldview. Isserles strongly disagrees; in *Torat*

expresses astonishment that not only the Sages, but even a prophet, could express a scientific belief that has been disproved. His solution is to point out that Maimonides himself notes that the science of astronomy does not seek to present models that accurately reflect reality, but rather models that are mathematically simple. Since the Sages forgot how to present their knowledge of the actual reality in a way that was mathematically straightforward, it was the Ptolemaic model that triumphed. Nevertheless, Isserles assures his readers, the Sages' position that the sphere is fixed and the constellations revolve is necessarily factually correct, since it was known via prophecy, "which is superior to philosophical speculation."<sup>25</sup>

In considering Isserles' discussion, there are a number of observations to be made. First is that his apologetics are remarkably strained, as his contemporaries observed. Azariah De Rossi writes that he was initially excited to read a work which purported to reconcile the statements of the Sages with contemporary science, but upon reaching Isserles' conclusions, he observed that Isserles "was interpreting the passages in a far-fetched manner... He covered them with plaster, such that one could not believe that our Sages' statements could be described in the manner he suggested, and if they had intended to say that which he claims, they undoubtedly would never have used those words... it is certainly the best course to be silent rather than to justify the righteous with arguments that are not correct."<sup>26</sup> It is remarkable that Isserles went to such lengths, at the time unprecedented, rather than following the medieval authorities and simply acknowledging that the Sages were incorrect in their cosmological model.

The second observation to make is that Isserles never addresses the dispute between the Jewish and gentile scholars regarding the sun's path at night.<sup>27</sup> In light of all his rhetoric concerning the status of the Sages' pronouncements and his apologetics to uphold them, he surely could not have accepted that the Jewish scholars were in error regarding the sun's path at night. But it is difficult to see how he could possibly have explained away their words, even with his view that the word *rakia* refers to the earth rather than to the firmament.

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*Ha-Olah* 1:5, he references his discussion in *Mehir Yayin* and stresses that since the description of the spheres producing sounds was given by Ezekiel, it must be true, and the view of the philosophers is to be rejected.

<sup>25</sup> Herbert Davidson discusses Isserles' position in "Medieval Jewish Philosophy in the Sixteenth Century," in *Jewish Thought in the Sixteenth Century*, ed. Bernard Cooperman, (Cambridge, MA, 1983) 132-36; however, it seems to me that he inaccurately portrays Isserles' view of the Sages' position as being less certain than he actually was.

<sup>26</sup> *Me'or Enayim* (Mantua, 1573-75), *Imrei Binah* 1:11 p. 56b.

<sup>27</sup> Note that he has the Gentile scholars' victory over the Jewish scholars as being with reference to the stars and spheres, in contrast to our version of the Talmud.

But most puzzling of all is a statement by Isserles much later in *Torat Ha-Olah*. He presents a novel astronomical model in which the stars, rather than being unchanging and incorruptible, periodically cast off their forms and attain new and different ones. This serves to solve certain problems in astronomy. Isserles notes that this approach has far-ranging explanatory power, and yet he abandons it as a general model, retaining it only for the eighth sphere:

In truth, in this manner we could account for all aspects of astronomy. However, this would be in accordance with the view of the sages who said that the sphere is fixed and the stars revolve, and they already said that the Gentile scholars triumphed regarding that. (*Torat Ha-Olah* 3:49)

This is an extremely perplexing turnaround. As we saw, earlier in *Torat Ha-Olah*, Isserles says that the gentiles only triumphed with regard to making a better case, but the view of the Sages remains valid. And in *Mehir Yayin*, Isserles rated the view of the Sages as being based on the prophets and thus necessarily correct. He also continued to follow the Sages' view, rejecting that of the Ptolemaic astronomers, in other places in *Torat Ha-Olah*.<sup>28</sup> Why, then, does he abandon it here, where it would “account for all aspects of astronomy”? Perhaps he is taking his cue from the Sages as he understood them—even though he is certain that the Jewish view is correct, he does not see it as being fruitful to pursue that, in light of the gentile view being dominant in the world of science.

What are we to make of Isserles' strained apologetics to maintain the Sages' views about the constellations and sun? If we examine the reason as to why he wrote about astronomy in the first place, we may find the answer.

Joseph Solomon Delmedigo (1591-1655, also known as Yashar MiCandia), speaks disparagingly of the Polish Jews for their opposition to the sciences.<sup>29</sup> But while they may not have matched the openness of an Italian-educated scholar such as Delmedigo, or that of Jews in Moslem lands, they were certainly very, very different from Ashkenazi Jews before the sixteen century, who did not engage in any branch of science in any way at all. The 16th century Polish chronicler Maciej Miechowicz writes that in Lithuania, “the Jews use Hebrew books and study sciences and arts, astronomy and medicine,”<sup>30</sup> and the cardinal Lemendone describes them as devoting time to the study of “literature and science, in

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<sup>28</sup> See *Torat Ha-Olah* 1:5, discussed in footnote 23 above, and 2:38.

<sup>29</sup> *Ma'ayan Ganim* (Odessa 1865), introduction, p. 129. For more on Delmedigo, see Isaac Barzilay, *Yoseph Shlomo Delmedigo (Yashar of Candia): His Life, Works and Times* (Leiden, 1974).

<sup>30</sup> *Tractatus de duabus Sarmatiis* (1517), II:1,3, cited by H. H. Ben-Sasson in “Poland,” *Encyclopedia Judaica*, vol. 13 (Jerusalem, 1972), 721.

particular astronomy and medicine.”<sup>31</sup> Fishman notes that close to a dozen Hebrew works on astronomy were composed in Poland between 1550 and 1648.<sup>32</sup> These include a number of sixteenth-century Hebrew translations and commentaries to Georg Peurbach’s 1456 book *Novae Theoricae Planetarum*, which was a popular text for teaching astronomy.<sup>33</sup> (In one anonymous such commentary, there is an off-handed reference to how the gentile scholars triumphed over the Sages of the Talmud with their view that the constellations are embedded in revolving spheres.<sup>34</sup>)

What was the reason for this new interest in astronomy? There was a certain influence from Italian and Spanish Jewry, as well as a revival of interest in Maimonidean rationalism and philosophy.<sup>35</sup> But perhaps most relevant to our topic is the environment in which the Jews lived. Cracow was home to Copernicus and to a university which, beginning in the mid-15th century, became the world’s greatest center for astronomy.<sup>36</sup> It is reasonable to propose that in such an environment, where gentile wisdom was so prominent, the Jews would likely either absorb the interest in this wisdom, or feel the need to catch up.

Returning to Isserles, perhaps the question of why he strained himself with apologetics can now be answered. Ruderman notes that it is unclear to what extent Isserles pursued his astronomical studies simply as a way to understand various Talmudic concepts, and to what extent it reflects a genuine interest in the sciences, or at least an accommodation to the fact of astronomy holding a privileged place in the larger environment of Cracow.<sup>37</sup> Davidson argues that Isserles was simply involved in harmonizing disparate texts rather than displaying any genuine interest in science for its own sake,<sup>38</sup> while Fishman considers that Isserles perceived a religious value in studying the laws of God’s creation. Langermann, while essentially agreeing with Davidson, observes that Isserles’ goal with these textual harmonizations was to address serious doctrinal problems such as Aristotle’s eternal

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<sup>31</sup> Cited by Ben-Sasson, *ibid.*

<sup>32</sup> David E. Fishman, “Rabbi Moshe Isserles and the Study of Science Among Polish Rabbis,” *Science in Context* 10:4 (December 1997), 574.

<sup>33</sup> Y. Tzvi Langermann, “Peurbach in the Hebrew Tradition,” *Journal for the History of Astronomy* 29 (1998), 137-50.

<sup>34</sup> MS. Paris, BN heb1097, p. 1b.

<sup>35</sup> See Davis, “Ashkenazi Rationalism,” 607-8.

<sup>36</sup> Eugeniusz Rybka, *Historia Astronomii w Polsce* (History of Astronomy in Poland), vol. 1 (Wroclaw, Poland, 1975).

<sup>37</sup> David B. Ruderman, *Jewish Thought and Scientific Discovery in Early Modern Europe* (Detroit, MI 1995), 69-76.

<sup>38</sup> Herbert Davidson, “Medieval Jewish Philosophy in the Sixteenth Century,” in *Jewish Thought in the Sixteenth Century*, ed. Bernard Cooperman, (Cambridge, MA, 1983) 132-36.

universe.<sup>39</sup> Consistent with this understanding of Isserles seeing science and natural philosophy as a threat to the faith that must be countered, we see that with the topic of the Sages' potential fallibility in astronomical matters, Isserles is very much on the defensive. As Fishman observes, this suggests that Isserles was aware of the prestigious accomplishments by gentiles in astronomy taking place in his city, and sought to reaffirm the validity of Talmudic teachings and the superiority of the sages.

A different way of reinterpreting the Talmud passages was implemented by R. Menahem Azariah da Fano (Fano-Mantua 1548-1620). He interprets the Talmud as referring to the metaphysical causes of the celestial motions, leading off from a discussion of the Midrashic account of the moon arguing with God:

And [the notion of] the argument (of the moon with God), which assigns wisdom and rebuke to the moon, can be justified; whether the celestial causes are live intelligences, or whether their operators (i.e. angels), who work on their behalf and are named after them, are the ones speaking. Establishing them as intelligent beings is the matter which was validated by the Sages of Israel in chapter *Mi Shehayah Tamei*, in their saying that "the sphere is fixed and the constellations revolve." And this means that the constellation is the uniquely intelligent aspect of the sphere, just as the brain in a man, which guides his body with intelligence, and desires and cleaves and becomes a throne of glory to the soul. So, too, is the situation with the constellation, which intelligently guides the sphere with its wisdom, and desires and cleaves and becomes a throne of glory to an angel. If so, the sphere is a possessor of an animate spirit, "fixed" in its perfection which exists in a man, and its intellect is the constellation which "revolves" to contemplate the will of its Creator, and arouses the appropriate movement in its sphere, and the soul which provides its intelligence is the angel, for otherwise it cannot fulfill its desire of contemplating the Divine Presence, just as the brain in a person cannot recognize its Creator with perfection without a soul. And the one who said that the constellation is fixed and the sphere revolves [also] spoke the truth, for it is the feet that transport the head... and the commentator who said that the Sages of Israel retracted and conceded to the one who said this, was out of line, for the passage is not in accordance with his words, leaving it as being that they were silent... Behold, in their wisdom, they did not wish to reveal their rejoinder and their reasoning. (*Asarah Ma'amarot* (Amsterdam 1649), *Em Kol Hai* 1:12, pp. 96b-97a)

According to da Fano, when the Sages stated that the sphere is fixed and the constellations revolve, they were not disputing the Ptolemaic model. Rather, they were explaining that the sphere does not move of its own accord; instead, its movement is caused

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<sup>39</sup> Y. Tzvi Langermann, "The Astronomy of Rabbi Moses Isserles," in *Physics, Cosmology, and Astronomy, 1300-1700*, ed. Sabetai Unguru, (Netherlands, 1991), 83-98, reprinted in Y. Tzvi Langermann, *The Jews and the Sciences in the Middle Ages* (Aldershot, 1999), ch. 7.

by the constellations, due to their (or their controlling angels) being intelligent, animate entities.

### III. Judah Loew: The Metaphysical Approach

Azariah de Rossi was apparently not the only one to cite the Talmudic discussion concerning the sun's path at night as a fundamental support for his critical approach. Apparently others did too, as we find that Judah Loew of Prague (1529-1609), whose sixth part of *Be'er HaGolab* included a condemnation and critique of de Rossi, sharply rebuts the rationalist approach to this topic *before* describing de Rossi's work and its novelty.<sup>40</sup> Loew begins by citing the relevant section, but with some interesting variations:

“The Sages of Israel say, During the day, the sun travels below the firmament, and at night, above the firmament. And the scholars of the nations say: During the day the sun travels above the firmament, and at night below the firmament. Rabbi said: Their words seem more correct than ours, for during the day the wellsprings are cool and at night they steam.”<sup>41</sup>

Loew's citation of the Talmud, in which the gentile scholars have the sun traveling *above* the firmament by day and *below* it at night, is found in certain manuscripts.<sup>42</sup> However this version is not found in other manuscripts and which was adopted by all other commentators, in which the gentiles had it traveling *below* the firmament by day, and below the *earth*, not the firmament, at night; and furthermore, it is not coherent. Later, we shall see that this is of considerable significance.

Loew continues:

They understand that the intent of the Sages was to say that the sun passes through the sphere, and that this is what was said by, “at night it travels above the firmament”; and if so, this would mean that the firmament was being temporarily pierced as the sun passes into the sphere. And this is impossible; it is also contradicted by the senses, for the sun only sets from the horizon; it does not set [at that time] for those that have a different horizon. And this cannot be contradicted by any intelligent person.

Loew's rejection of the straightforward understanding of the Talmud on the grounds that it is “clearly impossible” is based upon an anachronistic view. The truth is that something which appears “obviously” false in one era does not necessarily appear false to people in another era. There were many intelligent people, over a long period, who believed

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<sup>40</sup> Judah Loew, *Be'er Ha-Golab*, ed. Y. Hartman (Jerusalem, 1997) *Be'er HaShishi*, section 3, p. 177ff.

<sup>41</sup> For discussion of Loew's view regarding the spheres and the constellations, see Herbert Davidson, “Medieval Jewish Philosophy in the Sixteenth Century,” 136-39.

<sup>42</sup> New York, Jewish Theological Seminary, Rab. 1623.



that the world is flat, even though to later generations there appeared to be very obvious proofs that this is not the case.

And these people want to consider the words of the Sages, yet they have not grasped their meaning at all. For if the opinion of the Sages was that the sun passes through the sphere at night and travels above the sphere, they would not have said that “the sun travels above the firmament,” but rather that it travels above the sphere, just as they said previously, that the sphere is fixed and the constellations revolve.

It is indeed interesting that the Talmud uses the word “firmament” instead of “sphere,” but this would not appear to be sufficient grounds to depart from the plain meaning of the text. Note that Maimonides considers the two terms to be basically synonymous.<sup>43</sup> The Talmud probably used the term “sphere” simply to match the previous discussion, concerning whether the constellations or the sphere move.

Loew proceeds to explain that the firmament, rather than being a physical, solid dome over the earth, is the name for the separation between the material and spiritual realms:

Rather, the concept of the sphere and the concept of the firmament are distinct from each other. The “firmament” refers to that which is the firmament for the lower regions, and this is called “firmament” in the words of the Sages, and that is the firmament which is mentioned in the Torah; for the word “firmament” is never used for the sphere. And now, the opinion of the Sages who said that during the day it travels below the firmament, and at night it travels above the firmament, means that during the day, the sun is found in the world, and the firmament is the beginning of the lower region, and the sun travels below the firmament during the day, together with the lower regions. But at night, the sun is separated from the world, and it is with regard to this that it says that the sun travels above the firmament – meaning, the firmament which is the beginning of the lower regions. And then it is said that the firmament separates between the sun and the lower regions, for the sun is not found with the lower regions, and there is no doubt that the lower regions have their own border and this border is the firmament, and this explanation is well explained. And because they thought that the words of the Sages were in reference to the firmament which is the sphere, they thought it was something strange.

But you should know, that the sages were not speaking about this, except insofar as that their intent was that God, who separated between those that are on the earth below and those that are not on the earth and are above, and the firmament separates between them, and therefore the sun that God gave to the day to illuminate the earth travels below the firmament, and the firmament does not separate between the sun and the lower regions. But at night, when He did not give the sun to illuminate the earth, therefore the

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<sup>43</sup> Maimonides, *Mishneh Torah* (Warsaw 1881), Vol. I – *Mada*, Laws of the Foundations of Torah 3:1, p. 6.

firmament, which God gave to separate between the upper and lower regions, separates the sun from the earth.

Loew is stating that *because* God did not want the sun to illuminate the earth by night, *therefore* its spiritual essence is removed from the earth at that time (traveling above the firmament), which *results* in the sun disappearing from view—by passing below the horizon. Only during the day, when God wanted it to illuminate the earth, did He permit its spiritual essence to be exposed and for it to travel below the firmament.

And the scholars of the nations say that it is the opposite of this; that during the day, the sun travels above the firmament, as the firmament separates between the sun and the lower regions, and that such is appropriate, for otherwise the sun would be too effective in the lower regions, and they would not be able to exist, and therefore when the sun is on the earth, it travels above the firmament, and when it is nighttime and it is separated from the earth, there is no separation of the firmament.

According to the gentile scholars—with the version of the text that Loew had—the spiritual essence of the sun has to be restricted by day, so as not to overpower the earth, and it therefore travels *above* the firmament. Only at night, when the sun is in any case physically removed from the earth, can its spiritual essence be allowed to express itself unchecked, and it can travel *below* the firmament.

And this is what Rebbi replied with “their words appear more correct than ours, for during the day the wellsprings are cold, and at night they steam,” for from this you see that at night the sun is not separated from the lower regions, and therefore the wellsprings steam, but by day the wellsprings do not steam as they do at night, for God placed the firmament, which separates between the upper and lower regions, to separate between them, and therefore the wellsprings are cold by day. And according to our position, that we say that the sun travels above the firmament at night, the firmament separates between the sun, and it cannot operate upon the wellsprings.

According to Loew, Judah the Patriarch conceded that since the wellsprings are warmer by night than by day, this means that the sun travels below the firmament at night, as the gentile scholars maintained.

And this is true, for the waters themselves are suited to steam at night in that the sun travels opposite the sea and rules over the element of water, and during the day it is the opposite. This is the truth of the firmament, for Scripture states, “Let there be a firmament in the midst of the waters, and it will separate between the waters.” And it further states, “And God separated between the waters that were below the firmament and the waters that were above the firmament.”

Loew appears to be saying here that the real reason why the wellsprings steam at night is not because the sun is passing below the firmament, but rather because the sun has power

over the spiritual element of water at night. He does not explain why the Talmud omits this important explanation as to why the Jewish Sages were actually correct.<sup>44</sup> Instead, he simply concludes by putting down those who interpret this account literally:

And all these things were concealed from them and they knew nothing of this, for those people only have a portion in that which is revealed and can be detected, and if so, how can they respond to matters that are concealed and hidden, for they do not know what the concept of the firmament is. And this is not the place to explain the concept of the firmament further; we shall yet explain it.

I must admit that Loew's approach is incomprehensible to me, especially in terms of correlating it with the fact that the earth is inhabited on all sides.<sup>45</sup> The only comprehensive academic discussion of Loew's exceedingly cryptic words that I have been able to find is that of the French Algerian philosopher Henri Atlan.<sup>46</sup> Unfortunately, his elaboration is scarcely less cryptic, but due to the importance of such a rare analysis, I am citing it here in full:

This discussion, with its somewhat curious conclusion, is the clew of the labyrinth for later readers, including the same Maharal of Prague, for whom the text must be understood as juxtaposing, not two realistic models of the universe, but two symbolic ones; one of them (that of the Gentile sages) could *also* be understood, and perhaps accepted, as a concrete model. Thus we are dealing here with a symbolic representation whose pretext is what would today be considered a scientific model, relying on it even while distinguishing itself from it. This being the case, "firmament" must be understood according to its scriptural definition (Genesis 1:6-7); namely, as the locus of separation between the "upper waters" and the "lower waters."

The issue in dispute is thus the role of this separation vis-à-vis our experience of daylight. For the Jewish sages, this light illuminates only the "lower waters," site of the multiplicity of visible objects, whereas the "upper waters" (those above the heavens) remain in the solar penumbra, adequately illuminated by a more potent light—one hidden from us—the light

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<sup>44</sup> Hartman invokes Jacob b. Meir, claiming that his explanation sheds light on Loew's explanation, but this is difficult, as Jacob b. Meir (barring apologetics) was referring to the physical universe.

<sup>45</sup> Although Loew writes at length, he either does not provide sufficient words that actually explain his interpretation, or his explanation is simply incompatible with the fact of the earth being inhabited on all sides. I would further point out that Yitzhak Adlerstein, in his English adaptation of select portions of *Be'er HaGolah* (New York, 2000), omits this section entirely, and Joshua Hartman, in his annotated edition of *Be'er HaGolah* (Jerusalem, 1997), provides very little in the way of actual explanation, so I suspect that even dedicated followers of Loew also struggle with his intent here.

<sup>46</sup> For some further discussion of Loew's approach to this topic, see Andre Neher, *Jewish Thought and Scientific Revolution of the Sixteenth Century*, 206, 210 and 246.

of the First Day, before the creation of the sun, in the mythical narrative of the seven days of Creation. As such, these upper waters are simultaneously the locus of the hidden oneness of things and of the origin of questioning. During the night, according to this view, the sun returns to the upper waters to illuminate them in their turn, or perhaps, on the contrary, to imbibe from them the light it will use to illuminate the earth during the following day. This view is opposed to that of the Gentile sages, for whom daylight is the only light, illuminating with (almost) clarity all worlds, from the multiple and bounded reality of our own experience to the infinitude of possibilities above the heavens. In this second view night acquires a quite different symbolic value: instead of being a means for renewal from the sources above the heavens, it becomes a sojourn in the netherworld, beneath lower waters and the earth that supports them.

At the same time, however, the firmament acquires a different meaning: it serves essentially as a screen to protect against a surfeit of light and heat during the day, because the sun is considered to emit its radiation from above the firmament. In this conception, moreover, during the night the sun affects the lower waters, too, through a screen, the earth itself, which, although opaque, does not keep the sun from heating the subterranean waters. Thus the succession of day and night takes place on a single level, that of the sun's mediated effect on the lower waters—the world of our terrestrial experiences—with the effects of illumination prevailing over those of heating during the day, and the reverse during the night. For the Jewish sages, by contrast, this function of the screen needed to protect against direct solar radiation is filled by a sort of “sheath” in which the sun, according to this tradition, is normally enclosed; whereas the firmament is an opaque veil separating two different worlds, two separate levels, between which the sun passes directly during the alternation of day and night. In this conception the night, although a period of darkness for the lower world, is a time of light for the upper world, that world “above the sun” where new things can come into being, whereas, according to Ecclesiastes, “there is nothing new under the sun.” This supersolar sphere, penetrated by the sun during the night and illuminated from bottom to top, while the moon reigns elsewhere, alludes to the midrashic dialectic of moon and sun, in which the lunar sphere is perceived as being in certain respects superior to the solar, for all that the latter is brighter, precisely because of the capacity for death and resurrection expressed by the phases of the moon. (Henri Atlan, *Enlightenment to Enlightenment* (Albany, NY, 1993), 266-7)

Whatever the nuances of Loew's view, it was radically different than anything preceding it. His approach of interpreting Talmudic statements as referring to a metaphysical reality is a creative novelty when applied to aggadic legends in the Talmud, but to apply it to this discussion is another matter entirely. Loew was the first to claim that the Talmud is not actually describing a dispute regarding astronomy. His argument that nobody could have ever believed that the sun goes behind the sky at night is not only anachronistic from a modern perspective; even his predecessors never thought to make such an argument in

order to discard the plain meaning of the discussion. One must wonder whether Loew realized that his approach went against that of all the medieval scholars, and how he accounted for this. Did he think that he had rediscovered the true meaning of the Talmud, that all the earlier interpreters had somehow missed? Or did he think that their words, too, require some sort of deeper explanation? It is impossible to know.

It is not unusual for a conflict to be resolved by positing that one side is referring to a different plane of existence; such a technique was used in the sixteenth century to harmonize different kabbalistic systems. But to apply this approach to a straightforward Talmud text is revolutionary. The idea that the Sages were not even discussing the science of astronomy goes against the plain meaning of the Talmud, as well as going against the full spectrum of previous interpretations. But the appeal of such an approach is obvious; it allows one to maintain belief in the infallible knowledge of the Jewish sages, and the superior level of discourse at which they operated.

#### IV. David Gans, Yom Tov Lippman Heller, and Joseph Delmedigo: Scientific Vindication

David Gans (1541-1613) was an unusual figure.<sup>47</sup> A disciple of both Moses Isserles and Judah Loew, he was a diligent student of science, and grappled with many issues raised by the discovery of the New World and the revolutions in the field of astronomy. Gans notes that the Sages conceded to the gentiles regarding the constellations being embedded in the spheres rather than having independent movement.<sup>48</sup> However, he reports that the famous astronomer Tycho Brahe told him that the Sages were actually correct and that the stars do possess independent motion; he adds that he heard the same astronomical fact from Johannes Kepler.<sup>49</sup> He concludes by citing Abarbanel's mention of how such questions

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<sup>47</sup> For a full (albeit bordering on hagiographic) study, see Andre Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century: David Gans (1541-1613) and his Times*; but see the extremely critical review of Neher's work by Yaakov Elbaum, *Tarbitz* 55:1 (1986), 145-59. See too David Ruderman, *Jewish Thought and Scientific Discovery in Early Modern Europe*, 82-86. For more on Gans see Yaakov Reifman, "A Biography of Rabbi David Gans (author of *Tzemach David*) and his Literary Activities" (Hebrew) *HaMagid* 14, and the response by Mattityahu Strashun, *Mivhar Ketavim* (Jerusalem, 1969), 234-42; Mordecai Breuer, "Modernism and Traditionalism in 16th Century Jewish Historiography: A Study of David Gans' *Tzemach David*," in *Jewish Thought in the Sixteenth Century*, edited by Bernard Cooperman (Cambridge, MA, 1983); and Yaakov Elbaum, *Petihut VeHisgarut*, 250-52.

<sup>48</sup> *Nehmad Ve-Na'im* (Jesnitz, 1743) 1:25, p. 15b.

<sup>49</sup> For extensive discussion of this passage in *Nehmad Ve-Na'im*, see Noah J. Efron and Menachem Fisch, "Astronomical Exegesis: An Early Modern Jewish Interpretation of the Heavens," *Osiris*, 2nd Series, Vol. 16 (2001), 72-87; Andre Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century*, 216-28.

were in doubt amongst the Sages, apparently in order to show that it had already been pointed out that the Sages' concession was not absolute.

In presenting Brahe as having vindicated the Sages, Gans apparently failed to realize that the view of the Sages was part of a Babylonian cosmology, in which the stars move around a dome above a flat earth. Whereas the Sages had believed that the stars move and the sphere is fixed, Brahe had shown that there is no sphere at all, only space.

Gans describes the Ptolemaic, Copernican and Tyconic cosmological systems, praising them all. He does not attempt to evaluate which was ultimately correct, which would have been beyond the goals of producing an introductory text, too technical for his readers, and which was in any case impossible to resolve definitively at that time.<sup>50</sup> Yet he makes no mention of the ancient Babylonian system. Could he really have been unaware of all the passages in the Talmud and Midrash which indicated that the Sages believed in an entirely obsolete cosmological model? Even as he was delighted that Tycho Brahe had apparently justified the Sages' statement that the stars move independently of the sphere, did he not notice that the Sages had described the sun as passing behind the firmament at night? This does not seem possible, especially since Gans was familiar with de Rossi's work, which dwells on this topic at length.

It seems that Gans would have been embarrassed by the Sages not having subscribed to any of three cosmological models that were currently considered viable. Living in Prague, alongside Kepler and Brahe, the Talmudic views on cosmology would have appeared especially primitive. As Efron and Fisch note, Gans feared that Jews appeared ignorant in the eyes of the Christian intelligentsia, and sought to rehabilitate their image. In the introduction to his works, he describes the goals of his writings as being to reassert the expertise of Jews in these topics vis-à-vis the gentiles. In his introduction to *Tzemah David*, he writes:

Since we are foreign residents [*gerim ve-toshavim*] among the gentiles, and when they tell or ask us of the first days of ancient dynasties we put our hands to our mouths and we do not know what to answer, and we seem to them like beasts who do not know their left from their right, and it is as if we were all born yesterday. But with this book, the respondent can answer and say a tiny bit about every epoch, and through this we will appeal to and impress them.<sup>51</sup>

And in the introduction to *Nehmad Ve-Na'im*:

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<sup>50</sup> Efron and Fisch, "Astronomical Exegesis," 80-81.

<sup>51</sup> *Tzemah David*, ed. Mordecai Breuer (Jerusalem, 1983), 166-7. Translation from Efron and Fisch, "Astronomical Exegesis."

When the Gentiles see that we are devoid of this wisdom, they wonder about us and they taunt and curse us [Isa. 37.23], and they say, “Is this the great nation about which Scripture said ‘This great nation [comprises] only wise and understanding people?’” [Deut. 4.6] And what will we do on the day that the wise men of the nations speak to us and ask us the reasons behind the foundation of our intercalation, and for them the fact that we received [this wisdom] will not suffice. Is it proper for us to put our hands before us and appear as a mute who cannot open his mouth? Is this [to] our honor, or the honor of our creator?<sup>52</sup>

Given this background to his enterprise, it comes as no surprise that he seized upon an instance where the latest science appeared to confirm a Talmudic position and show it have been mistakenly rejected, and ignored those instances where the Talmudic view of cosmology had clearly been proven false.

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An important contemporary of David Gans was Yom Tov Lipmann Heller (1578-1654), a prominent rabbi who lived in Prague and various communities in Poland. Heller first addresses the dispute between the Jewish and gentile scholars in the context of a discussion regarding comets. Although some of the ancient Greeks considered comets to be planets,<sup>53</sup> Aristotle believed comets, along with shooting stars, to be atmospheric phenomena—a flash of light caused by interactions between elements rising from the earth.<sup>54</sup> This view continued throughout the medieval and Islamic era,<sup>55</sup> and was thus adopted by Maimonides.<sup>56</sup> In 1614, Heller cited Maimonides’ view, and explained it as being consistent with a statement in the Talmud by Samuel of Nehardea, who admitted (in Heller’s interpretation) that he could not account for the way in which comets, unlike stars, appear and disappear. But fourteen years later, Heller returned to the topic of comets, and this time he also refers to the view of Rashi. In contrast to Maimonides, Rashi describes comets as “stars that shoot like arrows.”<sup>57</sup> Heller suggests that the dispute between Rashi and Maimonides correlates with the dispute between the Jewish and gentile scholars regarding whether the constellations move or are fixed in the spheres, with Rashi’s view

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<sup>52</sup> *Nehmad Ve-Na'im*, p. 10a. Translation from Efron and Fisch, “Astronomical Exegesis.”

<sup>53</sup> Tofigh Heidarzadeh, *A History of Physical Theories of Comets, From Aristotle to Whipple* (Secaucus, NJ, 2008), 10.

<sup>54</sup> *Ibid.*, 4-15.

<sup>55</sup> *Ibid.*, 23-30.

<sup>56</sup> Maimonides, *Commentary to the Mishnah, Berakhot* 9:2.

<sup>57</sup> Rashi to Talmud, *Berakhot* 58b, s.v. *kokhva d'shavit*.

following that of the Jewish sages, and Maimonides' view correlating with that of the gentile scholars.<sup>58</sup> Yet he does not take sides as to which is correct.

A few years later, however, Heller returned to this topic again. This time, he rates the view of the Sages as being supported by Scripture itself:

There is a well-known dispute from the time of the ancient rabbis, of blessed memory, whether the stars move and the sphere is fixed, or whether the sphere moves and the stars are fixed. The view of our sages, of blessed memory, is that the stars move and the sphere is fixed... And Scripture supports them, for after it is written, "God made the two luminaries" (Gen. 1:16), Scripture explains that "He placed them in the firmament" (v. 17). It may be seen from this that the luminaries are distinct entities rather than being [made] out of the firmament itself. This correlates with the view that the luminaries are that which moves and that the sphere is that which is fixed. The luminary is an entity that is separate from the firmament and it moves in an orbit around the firmament.

He does, however, continue to note that the verses can be explained differently, in which the description of the luminaries being "placed" refers to their having a special designation rather than describing a physical process. Nevertheless, it seems that he prefers to see Scripture as supporting the view of the Sages. At this point, much of the manuscript is missing, but Joseph Davis ingeniously argues that Heller apparently followed Gans in presenting Tycho Brahe's vindication of the Sages' position.<sup>59</sup>

It is clear that, like Gans, Heller was concerned that the Jewish People should demonstrate their tradition's expertise in astronomical matters. In striking contrast to Jews who lived in these lands in previous centuries, Heller writes about how every Jew, beginning in his youth, has an obligation to study astronomy.<sup>60</sup> He also wrote a greatly enthusiastic approbation to David Gans' *Magen David*, noting that such works restore the Jewish Peoples' wisdom in the eyes of the nations.<sup>61</sup>

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Joseph Solomon Delmedigo (1591-1655) wrote extensively on the topic of astronomy, in a work that would be the only comprehensive Jewish book on this topic for a long

<sup>58</sup> In correlating Rashi's view with that of the Jewish sages, he may be quite correct; as noted above, Rashi and Jacob b. Meir apparently maintained belief in the ancient Babylonian cosmology of the Sages of the Talmud.

<sup>59</sup> Joseph Davis, "Ashkenazic Rationalism and Midrashic Natural History: Responses to the New Science in the Works of Rabbi Yom Tov Lipmann Heller (1678-1654)," *Science in Context* 10 (1997): 619-21; *Yom-Tov Lipmann Heller: Portrait of a Seventeenth-Century Rabbi* (Oxford 2004), 166-68.

<sup>60</sup> MS. Oxford-Bodleian 2271, fol. 23a-b. See Davis, "Ashkenazic Rationalism and Midrashic Natural History," 606.

<sup>61</sup> On the approbation, see Neher, *Jewish Thought and the Scientific Revolution*.



time.<sup>62</sup> While generally working within the framework of Ptolemaic astronomy, he was ahead of it in several ways, such as in his enthusiastic acceptance of heliocentrism as well as the potential for the existence of other inhabited planets.<sup>63</sup>

Delmedigo first mentions the dispute between the Jewish and gentile scholars as part of a general discussion about how the clash between Judaism and Greek philosophy that has existed for centuries was not only with regard to the conflict between an eternal universe and one that was created, but also with regard to other topics:

And similarly, there are many opinions or beliefs amongst us that are a heritage from our ancestors, and the philosophers mock us and bring proofs against them that are victorious, [albeit] not proven; and nevertheless we do not listen to their voice, and our hearts cling to our Torah, “as Mount Zion that shall never move.”<sup>64</sup> And, by the life of my head—the Sages of Israel did not act appropriately, when they abandoned their opinion with regard to the sphere being fixed and the constellations revolving, and accepted the opinion of the gentiles. For in our time, most scholars have disqualified that which they accepted, and have adopted that which they negated... (*Sefer Elim* (Odessa 1867) p. 87)

He returns to this theme in a later volume, in the context of a specific discussion about whether the stars possess independent movement or are embedded in spheres:

And others believe that the stars move in orbits without spheres. And in their view, the Sages of Israel did not act correctly in acknowledging to the gentile scholars that the constellations are fixed and the spheres revolve. For perhaps their original opinion was transmitted from the prophets; and they should not have abandoned those who had access to the Source in favor of those who provide explanations and reasons, as long as they do not establish their position with clear proofs. (*Sefer Elim*, part 4, *Gevurot Hashem, madregah* 5, p. 299)

Yet for all his passion for the validity of the Sages' view, and the suggestions that it was based on tradition from the prophets, Delmedigo would not have *fully* endorsed the Sages' position that the stars move and the sphere is fixed, since elsewhere he stresses how the ancient belief in spheres is without foundation, and all that exists in space is ether.<sup>65</sup> Like Isserles, Gans, and Heller, he makes no reference to the Sages' position regarding the sun's

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<sup>62</sup> For general discussion about Delmedigo's writings on astronomy, see Isaac Barzilay, *Yoseph Shlomo Delmedigo (Yashar of Candia): His Life, Works and Times* (Leiden, 1974), 150-66.

<sup>63</sup> *Sefer Elim*, part 4, *Gevurot Hashem*, pp. 292-3. The idea of an infinite number of solar systems had been proposed by the ill-fated Giordano Bruno.

<sup>64</sup> Psalms 125:1.

<sup>65</sup> *Sefer Elim*, p. 61. See Isaac Barzilay, *Yoseph Shlomo Delmedigo (Yashar of Candia): His Life, Works and Times*, 156, 159-160.

path at night, but much later he acknowledges that the Sages' general model of the universe was incorrect, both in their belief that the earth floats on water, and in their belief that the sun penetrates the firmament:

And regarding the suspension of the earth on nothingness, it seems that your question stems from your discomfort with the words of the psalmist who wrote, "To He that spread out [*le-roqa*] the land upon the waters," because the support needs a support, and on what are the waters spread out? He thus has ignored the main miracle in favor of a secondary aspect! If [the psalmist] believed, like Thales the Milesian, that the land floats on the water—which is unnatural, [for it requires] the heavier substance to float on the lighter one—he would have believed that the waters are infinitely deep. But that view, with all its ideas, is incorrect, since it has been proven empirically that [the earth] is spherical. Thus the expression established [by the sages] in the first blessing of Sabbath morning, "and [God] splits the windows of the firmament," is in accordance with their belief, which is mentioned in the Talmud. One should not be astonished if they strayed from the truth when they spoke of matters outside of their occupation and expertise, and regarding which they had no tradition; for the Greek experts erred in them, and their successors perpetuated those errors. (*Sefer Elim, Ma'ayan Hatum* #67, p. 438)

But, like Gans and Heller, Delmedigo wishes to focus on the Sages' technically correct belief in the stars possessing independent motion, as a vital part of his wider presentation about how Jews should be confident in their ancient traditions and not abandon them under pressure from alien ideologies which have not adequately proven their case. Yet this sentiment, which he expressed on several occasions,<sup>66</sup> is somewhat ironic in light of the fact that few were as progressive as Delmedigo in accepting so many aspects of the new astronomy. But perhaps it was precisely his realization that so much of the new astronomy was correct, and so different from ancient views, that sensitized him to the need to "save face" for the Sages in any way possible.

#### V. Joseph Ashkenazi: Complete Rejection of Science

Joseph Ashkenazi (Poznan-Livorno-Safed, c. 1529-before 1582) was a staunch anti-rationalist who fought against the study of philosophy and the adoption of the philosophical approach.<sup>67</sup> Included in this battle was a polemic against the entire Ptolemaic cosmology, in which he marshals Scripture and Talmud as well as scientific arguments

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<sup>66</sup> See too p. 61, where Delmedigo disdains modern science in favor of ancient Jewish traditions.

<sup>67</sup> For more on Ashkenazi and his opposition to philosophy, see Elchanan Reiner, "The Attitude of Ashkenazi Society to the New Science in the Sixteenth Century," *Science in Context* 10:4 (December 1997), 589-603.

against the notion of a spherical earth surrounded on all sides by the heavens.<sup>68</sup> As part of this, Ashkenazi insists that the Sages' declaration, that the position of the gentile scholars "appears" correct, only meant that it superficially *appears* correct; they were not conceding that the gentile scholars were actually correct. He argues that the Sages themselves would not have thought that a Ptolemaic sun would have heated up the waters from its passage on the other side of the world, since, in that model, it is even more distant from them than during the day.

Unlike the figures discussed earlier, it appears that what motivated Ashkenazi was actually not an insecurity vis-à-vis advances in science, nor a traditionalist desire to boost the authority of the Sages. Rather, it appears that his insistence on the Sages being correct stems from a desire to discredit Ptolemaic cosmology, which in turn stems from a desire to undermine Greek philosophy in general.

Now, Ashkenazi was not the first figure from Ashkenaz to oppose Greek philosophy. Most notable of his predecessors in this was Moses Taku, a thirteenth-century Tosafist, who also wrote against certain aspects of Ptolemaic cosmology; he argues that the earth is suspended directly by God, rather than through the force exerted on all sides by the heavenly sphere.<sup>69</sup> Yet Taku does not deny that there exists a sphere which encompasses the earth on all sides, which is the most fundamental component of Ptolemaic cosmology vis-à-vis Babylonian cosmology. True, he later regards it as offensive to posit that angelic entities are below the earth as well as above, and he seems fairly committed to the idea of the celestial heavens being vertically above the earth rather than surrounding them on all sides.<sup>70</sup> Nevertheless, while he argues that it is overly presumptuous of the philosophers to be certain that the sun and stars must be embedded in spheres, and that the Sages knew of their limitations regarding such determinations, he does not go so far as to argue that the philosophers must be incorrect.

Why, then, did Ashkenazi feel the need to go so much further than his predecessor and to discredit Ptolemaic cosmology in its entirety? Perhaps the question should instead be as to why Taku did not go as far as Ashkenazi. Facing a threatening alternate system of knowledge, both Taku and Ashkenazi desired to discredit it as much as possible. But Taku was unwilling to go against the plain meaning of the Talmud itself, which had the Sages conceding to the gentiles in at least some aspects of Ptolemaic cosmology; for following the

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<sup>68</sup> Portions of this were published by Gershom Scholem, "*Yediyot Hadasot al R. Yosef Ashkenazi*," *Tarbiz* 28 (1959), 218-20, who identified Ashkenazi as the author of this manuscript.

<sup>69</sup> *Ketav Tamim*, ed. R. Kirchheim, *Ozar Nehmad* 3 (Vienna, 1860), p. 82.

<sup>70</sup> *Ibid.*, 84.

straightforward reading of the Talmud formed the basis of much of his arguments for God's corporeal nature. Ashkenazi, on the other hand, lived in an era when reinterpreting difficult passages of the Talmud, from corporeal descriptions of God to otherwise challenging sections of the Aggadah, was the accepted norm. He was not as constrained by the plain meaning of the Talmud, and so could reject the notion that there had ever been any concession to Ptolemaic cosmology.

#### **Summary of Chapter Four**

The long sixteenth century saw a variety of new approaches to this topic, with relatively few figures continuing with the straightforward understanding of the Talmud that was prevalent in the medieval period. Arama and Abarbanel still accepted that the Sages were mistaken, but provided rationalizations for their error. Isserles and Da Fano contrived far-fetched reinterpretations of the Talmud in order to prevent the Sages from being mistaken. Loew insisted that the Sages were speaking about metaphysics rather than astronomy. Gans, Lippman-Heller and Delmedigo chose to focus upon one aspect in which the Sages had allegedly been vindicated. Finally, Ashkenazi insisted that the Sages were not wrong in any way.

## Chapter Four:

### Aftermath—The Mid-Seventeenth Century and Beyond

The long sixteenth century heralded a new trend in approaching this topic, which found many more adherents in the rest of the early modern period. In this chapter, I shall survey each of these categories in turn.

#### I. Reluctant Acceptance

In the seventeenth and eighteenth centuries, there were still those who acknowledged that the Sages were mistaken in their cosmological worldview. This was presumably because the Talmud clearly and unambiguously stated as such, as the medieval rabbis had near-universally acknowledged. But those advocating this view in the early modern and modern period were proportionately far fewer in number, and were vastly more uneasy about this than were the rabbis of the medieval period.

Isaac Lampronti (Italy, 1679-1756) states that the Sages seem to have erred in stating that lice spontaneously generate, and cites the dispute concerning the spheres and constellations as an example of the Sages themselves conceding that they were in error.<sup>1</sup> But on another occasion, he writes that the Sages knew all wisdom and that objections from scientists should be rejected.<sup>2</sup> This complex, even contradictory attitude towards disputes between the Sages and science is difficult to resolve, but it shows that, at the very least, he was uneasy with the notion of the Sages having erred.

#### II. Textual Reinterpretation

Amongst the followers of Isserles' approach was Jonathan Eibeschütz (1690-1764). He cites Delmedigo's astonishment at the Sages, whose position was based on traditions from the prophets, apparently conceding their error (with regard to the constellations and spheres) to the gentile scholars, whose opinions are "entirely based on fallible reasoning." Eibeschütz answers that there was no error and there was no concession. He presents a

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<sup>1</sup> *Pahad Yitzhak* (Lyck 1874), vol. 10, s.v. *tzeidab*, p. 21a. In *Pahad Yitzhak*, vol. 4, s.v. *klayot yoatzot*, p. 72b, he notes that he sometimes maintains that the Sages had divine sources of knowledge for their statements and sometimes does not. For a discussion of Lampronti's approach, see David Malkiel, "Empiricism in Isaac Lampronti's *Pahad Yisshaq*," *Materia Giudaica* 10 (2005): 341-51.

<sup>2</sup> *Pahad Yitzhak*, vol. 6, s.v. *nikkur*, p. 85a.

lengthy explanation as to how the Sages and the gentile scholars were both correct, with each having a different frame of astronomical reference. Eibeschutz presents a novel explanation of the statements that the Sages conceded (*hodu*) to the gentiles; he claims that *hodu* does not mean “acknowledged” in the sense of “conceded,” but rather in the sense of “praised” (as in, “*hodu l’Hashem ki tov*”). The Sages were not admitting that they were wrong; rather, they were praising the gentile scholars for being correct with regard to the astronomical frame of reference that they were discussing.<sup>3</sup>

### III. The Metaphysical Approach

Metaphysical and mystical interpretations of this topic, similar to that innovated by Judah Loew, subsequently proved very popular. Moses Haim Luzzatto (Italy and elsewhere, 1707-1746) likewise explains that when the Sages spoke of the sun passing behind the firmament at night, they were referring to the spiritual root of the sun.<sup>4</sup> Phineas Elijah Hurwitz of Vilna (d. 1821), in *Sefer HaBrit*, writes that references to the sun passing through windows refers to the upper spiritual worlds, where there truly are windows in the path of the spiritual sun. He notes that this was the view of all the Sages, being mentioned in the tractates *Eruvin*, *Bava Batra*, the Jerusalem Talmud and *Pirkei d’Rebbi Eliezer*, as well as in *Pesahim*. Hurwitz therefore expresses surprise at Judah the Patriarch’s apparent acquiescence to the gentile scholars and rejection of the all aforementioned Talmudic Sages—“surely they are all holy, and God is in the midst of them,” since Scripture also makes reference to the doors, gates and windows of Heaven.<sup>5</sup> He also objects that Judah the Patriarch brings “reason and experiment,” i.e. empirical evidence, to support the view of the gentile scholars, “and the Sage is not like the experimenter.” Hurwitz resolves this by saying that “these and those are the words of the Living God”—Judah the Patriarch was referring to the physical reality, whereas the aforementioned Sages were referring to the spiritual reality.<sup>6</sup>

The motivation behind the mystical approach, as Hurwitz makes clear, was to ensure that the revered Sages of the Talmud should not have committed a scientific error. As time went by, this consideration was also extended to the medieval scholars, and it became difficult for some to accept that Jacob b. Meir believed in a flat earth with a dome-shaped

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<sup>3</sup> *Ya’arot Devash* (Yozifov, 1866) 1:4, p. 31a.

<sup>4</sup> Adir BeMarom (Warsaw, 1886), part I, B’Shaata DiTzlota DeMinha DeShabbata p 66b, referencing *Bava Batra* 25b and *Sanhedrin* 91b.

<sup>5</sup> Psalms 78:23, Genesis 28:17, and Genesis 7:11.

<sup>6</sup> *Sefer HaBrit* (Jerusalem, 1989), 1:4, *Shnei HaMe’orot* 10, p. 69.

firmament. Thus, David Luria (Lithuania, 1797-1855) claimed that Jacob b. Meir, too, was referring to a spiritual mystical reality rather than physical facts.<sup>7</sup>

#### IV. Focus on Scientific Vindication

Meanwhile, there were also many authorities who followed in the footsteps of Gans, Lippman-Heller and Delmedigo in claiming that the new astronomy had vindicated the Sages. Judah Briel of Mantua (1643-1722), when addressed with a question concerning scientific error in the Talmud with regard to spontaneous generation, responds that the Sages of the Talmud are more reliable than scientists; and as an example of the superior wisdom of the Sages, he argues that they have been vindicated in their belief that the sphere is fixed and the constellations revolve within it.<sup>8</sup> Tobias Cohen (Poland-Italy-Jerusalem, 1652–1729), in a work that explicitly had as its goal to prove that Jews were just as enlightened and educated as non-Jews, makes the same point.<sup>9</sup> Aviad Sar-Shalom Basilea (Italy, c. 1680-1743), while reluctantly acknowledging that a person's faith is not compromised if he disputes some of the Sages on something that they said based upon their own reasoning, is at pains to stress that their intellects were greater than ours, and that those who attribute error to them often turn out to be mistaken; as an example, he cites the Sages' position that the sphere is fixed and the stars revolve.<sup>10</sup>

#### V. Complete Rejection of Science

Amazingly, even through to the eighteenth century, there were still those who followed Joseph Ashkenazi in maintaining that the Sages were actually correct.<sup>11</sup> Yair Haim Bahraḥ (Germany, 1638-1702), a towering halakhist who also studied science extensively, accepted that it is possible that the Sages may well have been in error, but was uncertain whether the gentile scholars were ultimately correct, and argued that such matters are in any case rarely ever resolved.<sup>12</sup> Jacob Reischer (1661-1733), author of *Shevut Yaakov*, derided the science of his day on the grounds that it opposes the Talmud's position that the earth is flat.<sup>13</sup>

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<sup>7</sup> See his note at the end of his introduction to *Pirkei De-Rabbi Eliezer with commentary of Radal* (Warsaw 1852), p. 15a (which due to a printer's error actually appears on the page before the page numbered 15a).

<sup>8</sup> Cited in Isaac Lampronti, *Pahad Yitzhak*, s.v. *Tzedah Asurah*, p. 21a.

<sup>9</sup> *Ma'aseh Tuviyah* (Lvov, 1867) vol. 1, *Olam ha-galgalim*, ch. 3, n.p.

<sup>10</sup> *Emunat Hakhamim* (Warsaw, 1888), ch. 5, p. 15a.

<sup>11</sup> See the sources cited by Kasher, "Shabbat Bereshit ve-Shabbat Sinai," pp. 647-48 n. 16.

<sup>12</sup> *Responsa Havot Ya'ir* (Lvov, 1896) #210, p. 111a; see too #219, p. 113b, where he describes how he destroyed his own writings on astronomy in a fire. Davis ("Ashkenazi Rationalism," 607) points to this as an interesting contrast to Moses Rivkes, a scholar of the previous generation, who, when forced to flee his home, took only his tefillin and an astronomical table.

<sup>13</sup> *Responsa Shevut Yaakov* (Metz, 1789) 3:20, p. 8b.

Elijah Kramer, the “Vilna Gaon” (1720-1797), makes some cryptic comments about how the Ptolemaic astronomers developed their model of stars embedded in spheres and rejected the Sages’ model due to various astronomical objections, which he claims it is possible to resolve.<sup>14</sup>

### Summary of Chapter Five

The five new approaches to this topic that began in the sixteenth century set the tone for how it would be addressed in the following centuries. Some, similarly to Isaac Arama, still accepted that the Sages were mistaken, but found it necessary to explain how this could have happened. Some followed Isserles and Da Fano in contriving new ways of interpreting the Talmud in which the Sages were presenting correct astronomical invitation. Others adopted the somewhat easier approach of Judah Loew, and insisted that the Sages were speaking about metaphysical concepts. Still others followed Gans in focusing on those statements by the Sages which were vindicated, and there were even those who followed Ashkenazi in steadfastly rejecting not only modern science, but even the Ptolemaic model.

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<sup>14</sup> *Sefer Yetzirah* with commentary (Jerusalem, 1965), 6:1, p. 39.



## Chapter Five: Conclusion

The Talmud's discussion concerning the Sages' views of cosmology struck Jews over the centuries as being quite extraordinary. First there is the matter of the Jewish sages holding a view of the universe that is startlingly inaccurate; then there is Judah the Patriarch deciding that the gentiles are correct and the revered Jewish sages are in error. In the introduction, we cited Isadore Twersky's observation that "the passage has a long history of interpretation, reflecting various moods: embarrassment, perplexity, satisfaction, with some attempts at harmonization or reinterpretation or restricting the significance of the report."

But the *pattern* of this long history of interpretation is significant. For the rabbis of the medieval period, there was absolutely no doubt that the Talmud was discussing a dispute about astronomy, and for the overwhelming majority of them, it was to be straightforwardly understood as attesting to the Sages having been in error. Most reported this in a matter-of-fact way, apparently not seeing it as any cause for concern, while for some it was positive testimony of the Sages' intellectual honesty. The dissenting voice of that time, Jacob b. Meir, was not necessarily motivated by any consideration other than the desire to reconcile conflicting statements in the Talmud, coupled with the fact that he genuinely believed that the sun does indeed travel behind the sky at night.

Beginning in the mid-sixteenth century, this all changed. Arama and Abarbanel still accepted that the Sages were likely in error, but found it necessary to apologize for them and explain how this error came about. Moses Isserles and Menahem Azariah da Fano reinterpreted Talmudic texts and insisted that the Jewish Sages *must* have been correct. Judah Loew innovated an entirely new method of ensuring that the Sages remained infallible, by attributing an entirely different meaning to their words, according to which it was beneath the dignity of the Sages to be speaking about physical cosmology. David Gans, Tom Tov Lippman Heller and Joseph Delmedigo focused on those statements of the Sages which appeared to have been vindicated by modern astronomy. And Joseph Ashkenazi insisted that the Sages were entirely correct all along. As the centuries passed, even while there were still those who could not ignore the straightforward and traditional meaning of

the text, such reinterpretations and apologetics became increasingly desirable.<sup>1</sup> This topic reveals a clear divide between the medieval period and the early modern period.

What was the reason for this radical transformation in the attitude towards the Sages' obsolete cosmological worldview? One could propose that it relates to a wider context of Talmudic authority. Those who became known as the *Aharonim*—and probably even perceived themselves as launching a new era—now had to justify and uphold the authority of post-Talmudic authority figures, and this in turn would mean that the Sages themselves would, *a fortiori*, have to be elevated to an even greater stature.

But it appears to me that there is a more specific reason why the sixteenth century saw such dedicated innovations aimed at avoiding the notion that the Sages erred in this area. Jews in Europe, feeling intellectually put to shame by the scientific advances of Christendom in general, and the achievements in astronomy of Prague and Cracow in particular, could not accept that the Sages of the Talmud had been so grossly mistaken in these matters. Jews in Moslem lands in the medieval period had also been exposed to non-Jews making magnificent accomplishments in science, but the Jews at that time felt a part of a grand universal enterprise of scientific discovery and were already accustomed to accepting Greek philosophy. In contrast to this, Jews in Christian Europe had more of a competitive or adversarial relationship with gentiles and their knowledge, as well as being greatly behind them in their scientific knowledge. The ensuing sense of insecurity meant that concessions to gentile knowledge that had hitherto been acceptable now had to be reinterpreted.

Judah the Patriarch had no difficulties in accepting that the gentile astronomers were victorious over the Sages of Israel. But as the centuries passed, it became more and more difficult for rabbinic scholars to share his openness. Unsurprisingly, it was also difficult for them to accept the Copernican revolution that was taking place.<sup>2</sup> A new era of insecurity about rabbinic inferiority in scientific matters, to a degree that could not tolerate even the most explicit and hitherto acceptable of such cases, had begun.

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<sup>1</sup> In traditionalist circles today, on the rare occasions when this passage in the Talmud is discussed, the *only* approaches to be cited on this topic are those of Jacob b. Meir and/or Loew! See, for example, *Mishpachah* magazine's supplement *Kolmus: The Journal of Torah and Jewish Thought* 14 (Kislev 5771): 13.

<sup>2</sup> Hillel Levine, "Paradise Not Surrendered: Jewish Reactions to Copernicus and the Growth of Modern Science," in Robert S. Cohen and Marx W. Wartofsky, eds. *Epistemology, Methodology and the Social Sciences* (Holland, 1983), 203-225; Michael E. Panitz, "New Heavens and New Earth: Seventeenth to Nineteenth Century Jewish Responses to the New Astronomy," *Conservative Judaism*, vol. XL (1987-88), n. 2, pp. 28-42; and my own paper, "Jewish Responses to Copernicus and Heliocentrism."

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