

New Heavens and a New Earth

The Jewish Reception of Copernican Thought

JEREMY BROWN

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*For Erica, and Tali, Gavi, Yishai, and Ayelet
The unmoving center of my universe*

Behold, I create new heavens and a new Earth;
and the former things shall not be remembered,
nor come to mind.

Isaiah 65:17

If there is nothing new on the earth, still the traveler always has a resource in the skies. They are constantly turning a new page to view. The wind sets the types on this blue ground, and the inquiring mind may always read a new truth there.

Henry David Thoreau
A Week on the Concord and Merrimack Rivers

Astronomy is what we have now instead of theology. The terrors are less, but the comforts are nil.

John Updike

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they too were “sitting on the fence,” pulled by traditional beliefs and scientific thought in two, often opposite directions.

We have already noted the rapid growth in the numbers of periodicals during the nineteenth century, and it should also be noted that this growth included popular scientific publications. In 1845, for example, *Scientific American* was founded in New York, as a journal of “scientific, mechanical and other improvements.” In London, *Popular Science Review* was published in 1862, and it contained sections that summarized the latest scientific advances for the general reader.³⁹ The Jewish population of Europe was also provided with its own new journal of science, *Hazefrah (The Herald)*, first published in Warsaw in February 1862. It was conceived as a weekly newspaper for Jewish readers that would report “all those things that affected them, including politics, science and technology, world news and the natural world.”⁴⁰ The paper’s editor and main writer was Hayyim Zelig Slonimski, whose career exemplified how traditionally observant Jews were able to combine their interest in scientific matters with their faith. Slonimski was an inventor, a government inspector of rabbinic seminaries, and a prolific author who wrote widely on matters of astronomy and was an outspoken advocate of the Copernican model.⁴¹

Hayyim Zelig Slonimski

Hayyim Zelig Slonimski was born in 1810 in Bialystok to poor parents who came from Slonim in eastern Poland. He received a traditional *yeshivah* education, married at the age of eighteen, and developed an unusual interest in astronomy and mathematics.⁴² He read *Sefer Haberit* and *Tekhunot Hashamayim*, both of which mentioned the Copernican model and its advantages, as well as newer Hebrew mathematics books, such as Barukh Shick’s Hebrew translation of Euclid and Friesenhausen’s *Kelil Heshbon*.⁴³ He learned to read German, although the story of how he achieved this varies among biographers, but the result was that Slonimski became very knowledgeable about mathematics and astronomy (see figure 10.1).⁴⁴ Slonimski’s first few years of marriage were spent in Zubladow and Bialystok, and wherever he lived, he maintained a strictly Orthodox allegiance, although his biographers contend that his interests in science caused some friction in his family. Whether or not these interests caused the breakdown of his marriage is not known, but Slonimski divorced in 1836 and then moved to Warsaw.⁴⁵ There he boarded with Abraham Jacob Stern, who was himself a mathematician and inventor. Given Slonimski’s inquisitive mind, the two are likely to have formed a deep friendship, and Slonimski eventually married Abraham’s daughter Sarah. After the death of his father-in-law in 1842, Slonimski came into the possession of



Figure 10.1 Hayyim Zelig Slonimski at age seventy-five. From *The Jewish Encyclopedia*, New York, Funk and Wagnalls, 1912.

a calculating machine that Stern had developed. Slonimski introduced some small improvements to the device, and after demonstrating it to the Imperial Academy of Sciences in St. Petersburg, he was awarded the Demidov Prize together with twenty-five hundred rubles. In 1845, the Russian minister of education made Slonimski an honorary citizen, a remarkable honor given that this time period, under the reign of Nicholas I (1825–1855), was a “somber chapter in the history of Russian Jewry, characterized by their suppression and coercion.”⁴⁶

Slonimski’s creative nature took many directions. He perfected a device to decrease friction in steam engines and a method to coat iron utensils with enamel, although he never was able to reap the financial rewards of either.⁴⁷ Slonimski was also credited by the president of Western Union as having invented the telegraph, and although this was reported on the pages of *The New York Times*, this claim was incorrect.⁴⁸ What he actually did invent was a method to send two telegraphs simultaneously over one wire; the Russian army newspaper *Krasnaya Zvezda* (*The Red Star*) claimed that this demonstrated “...that our fatherland holds the priority on the duplex system of

electric telegraphy made public by the Russian scientist Z.Y. Slonimsky twelve years before Stirnes and fifteen years before Edison.⁴⁹

Slonimski's Literary Output

Although some of the stories surrounding Slonimski were exaggerated, his scholarly contribution was indisputably extensive. He was as prolific an author as he was an inventor and published his first book, *Mosdei Hokhmah* (*The Foundation of Wisdom*), a work on algebra, at the age of twenty-four.⁵⁰ His next book, *Kokhava Deshavit* (*The Comet*), was published in 1835, the year in which Halley's Comet returned, and we shall examine this work in detail.⁵¹ His other works include a controversial book in which he demonstrated that there were errors in the Hebrew calendar,⁵² a book demonstrating the existence of the soul using contemporary scientific discoveries,⁵³ and two further works on the calendar.⁵⁴ In addition, Slonimski struck up a friendship with the German naturalist and explorer Alexander von Humboldt (1769–1859). Humboldt had introduced Slonimski to King Friedrich Wilhelm IV of Prussia, and Slonimski published a work on the occasion of Humboldt's eighty-eighth birthday in 1857 that contained a biography of Humboldt together with a summary of his *Kosmos*, a four-volume work on the natural sciences.⁵⁵

However, Slonimski is best known as the founding editor of *Hazefirah* (*The Dawn*), the weekly Hebrew-language newspaper first published in Warsaw in 1862. The paper focused on popular expositions of science but also contained a review of politics and world events. The articles in the first edition—nearly all written by Slonimski—show the breadth of his interests. There was a summary of a new Polish law allowing Jewish surgeons to serve the state, followed by a review of current events as they affected Jews in France, Germany, Switzerland, and Italy. Next there was an illustrated article explaining how the telegraph works, followed by two historical pieces, the first on a Viennese family who traced their lineage back to 1550, and the second on Herod the Great. The eight-page newspaper ended with a discourse on a passage in the Talmud (by a guest writer), and Slonimski thanked those in Bialystok who had written to support his venture. This rather eclectic pattern continued until the newspaper closed after only six months when Slonimski became the head of the rabbinic academy in Zhitomir. In 1874, the Russian government closed the academy and Slonimski renewed publication of the newspaper in Berlin and later Warsaw, where it later became a daily paper and was published until it finally closed 1931.⁵⁶ Slonimski's first words to his readers, found in the opening paragraph of the first edition of *Hazefirah*, was a quote from the Book of Psalms: "You have made him rule over the work of your hands, you have put

all things under his feet.”⁵⁷ This quote seems fitting if only for the fact that the paper dedicated much space to explaining the latest scientific discoveries, but only the reader who recalled the entire eighth Psalm, from where the verse is taken, would appreciate its wider meaning. Given the enormous body of biblical literature from which Slonimski could have taken his opening quote, this choice was certainly not the result of some arbitrary fit:

O Lord, our Lord, how majestic is your name in all the Earth!
 You have set your glory above the heavens.
 Out of the mouth of babies and infants, you have founded strength
 because of your enemies, to still the enemy and the avenger.
 When I look at your heavens, the work of your fingers, the Moon and
 the stars, which you have set in place;
 What is man that you are mindful of him, and the son of man that you
 care for him?
 Yet you have made him a little lower than the angels and crowned him
 with glory and honor.
 You have made him rule over the work of your hands, you have put all
 things under his feet. . . .

The psalmist contrasted the remote stars with humanity, a contrast that might ordinarily have made mankind inconsequential. Not so, Slonimski reminded his readers, for as a result of divine grace, humans were made “a little lower than angels” and so have been “crowned with glory and honor.” Although the findings of astronomy can lead to existential despair, they may also result in a religious awakening. It was the perfect thought with which to open his newspaper.

Although Slonimski’s first work was on mathematics, his passion was astronomy. In one biographic essay published in 1912, he is described as having taken part in public debates with the elders of the *yeshivah* in which he studied soon after his first marriage. These rabbis could not accept Slonimski’s belief in the Copernican system, but despite his youth,

he emerged victorious as a result of his knowledge of mathematics and astronomy. [These debates] convinced him to teach these subjects to other students in the *Bet Midrash* wherever they may be, to inform them and to instruct them about the truth. He started to bring this dream to reality by writing a work encompassing all of the foundations of mathematics. . . .⁵⁸

Even Slonimski’s introduction to his work on mathematics contained a paragraph in which he described the importance of astronomy in general and the

truth of the Copernican system in particular.⁵⁹ He stated that one of the goals of the book was “to provide a clear path to understand the new astronomy.”⁶⁰ There is no doubt therefore that Slonimski saw the task of educating his fellow Jews about the truth of the Copernican model as one of utmost importance. He did not have to wait long before the perfect opportunity presented itself—the return of Halley’s famous comet.

Halley’s Comet and *Kokhava Deshavit*

To coincide with the appearance of Halley’s Comet, Slonimski published *Kokhava Deshavit* (*The Comet*) in Vilna in 1835.⁶¹ The book described where and when Halley’s Comet would be visible with precise coordinates for the inhabitants of Bialystok, as well as an explanation of the nature of comets and their orbits (see figure 10.2).⁶² In addition, there was a detailed exposition of

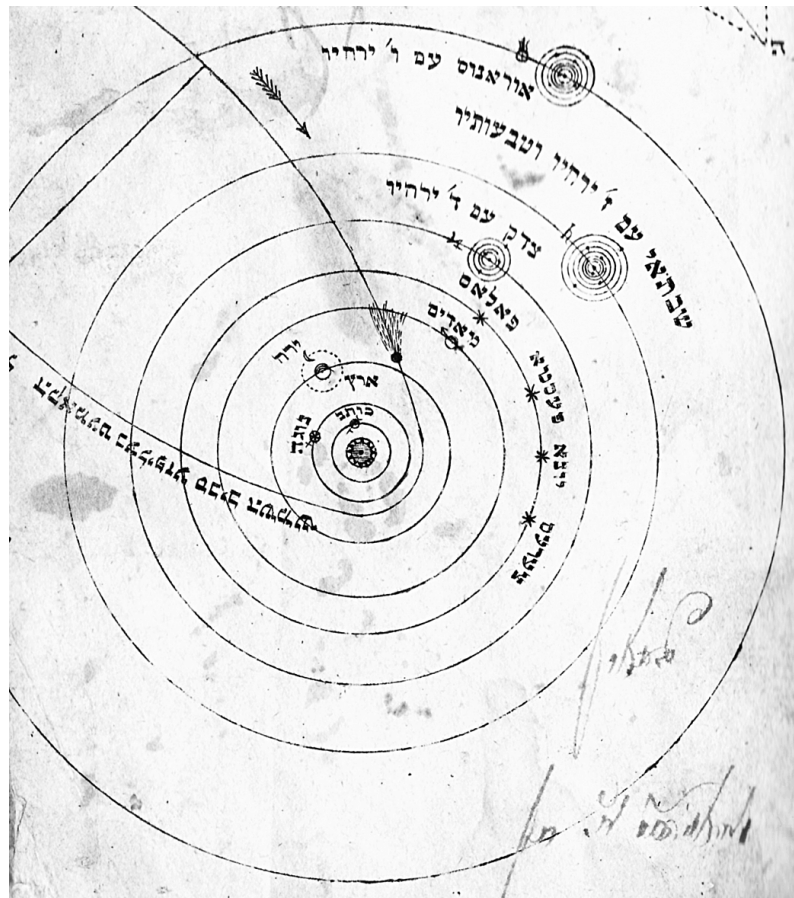


Figure 10.2 Orbit of Halley’s Comet from *Kokhava Deshavit*, Vilna, 1835. Note that the outermost planet is Uranus. The second edition of the book (1857) described the discovery of Neptune. From the collection of the author.

the Copernican model, which he believed should be accepted as true alongside the eternal truths of the Torah, "... for both are true and given by the true God."⁶³ This exposition actually takes up the majority of the book, and as the forward to the book by Abraham Zakheim made clear, the purpose of the book was as much to help others "tread down the paths of truth" about the nature of the Copernican system as it was to educate them about Halley's Comet.⁶⁴

Slonimski wrote of the advances made by contemporary astronomers, which could not have been imagined by earlier Jewish sages. He reminded the reader that comets were once thought to originate from the sky close to the Earth, "whereas now, contemporary astronomers know that comets are really like the stars... and they are able to measure their orbits, their distances, from where they came and where they will go. All of this clearly demonstrates the supremacy of contemporary astronomy compared to earlier astronomy."⁶⁵ He lamented the lack of Jewish interest in the subject, saying that "for many years we have sworn off from these sciences since they were not known to us." Unlike others we have encountered in our story, he made no claims to Jewish superiority in the sciences. In fact, Slonimski was highly critical of other Jews who, when faced with a scientific fact that seemed to contradict a *midrash* or *aggadic* passage, declared the science to be heretical:

This is not what any of our ancestors, the earlier great leaders did when they found a statement of the sages that contradicted a demonstrated and tangible fact. They did not conceal the truth, but rather made every effort to explain the statement in a different way, to reveal its inner rather than its literal meaning.⁶⁶ This is clear from all of their books!... And lest the reader, when he hears these things, think this is against the Torah and our faith, Heaven forbid, I have written this forward to prove that nothing that is a demonstrated and tangible fact can negate the Torah or our faith. For both [scientific facts and the Torah] are true and come from the true God.⁶⁷

Slonimski was not arguing for the supremacy of science over religious values, but for his contemporaries to find novel ways to reinterpret traditional texts in light of new scientific information. This called first and foremost for a reinterpretation of traditional texts, so that they did not contradict the Copernican model that had been demonstrated as true beyond question:

Specifically, if we believe that the Earth has a daily revolution around its axis, and a yearly revolution around the Sun, this does not contradict our Torah or our faith (Heaven forbid). For in his Torah God only revealed that which ensures eternal spiritual perfection, things

that are far from the normal understanding of a person. But God did not reveal the secret detailed workings of creation. Instead he left this goal for the mind.⁶⁸

Slonimski dismissed the standard counterclaims from the biblical verses that seem to imply a geocentric universe for two reasons. First, some of these verses used “flowery language” that could be understood in ways not directly implied by the literal meaning of the verse. But that still left some verses the literal meanings of which suggested that the Sun indeed moves. To explain these, Slonimski introduced his readers to the concept of relative motion. All movement is relative, and the statement that an object is in motion could only be understood when that same object is compared to another that is at rest. It is for this reason that the Bible suggests the Sun moves; if we assume a stationary Earth, this is indeed what *appears* to occur. In addition, it is often simply more convenient to speak of the apparent movement of the Sun and, Slonimski continued, even astronomers who accepted the Copernican system would often describe the Sun as rising, for this is “a convention of language.”

As well as an exposition of the Copernican system, *Kokhava Deshavit* contained an explanation of Kepler’s three laws of planetary motion and an outline of Newton’s law of universal gravitation. A separate chapter called “Proofs that the Earth has both a daily and yearly motion” described the discovery of stellar aberration by the British astronomer James Bradley; this was an early, indirect proof of the validity of the Copernican system.⁶⁹ Before continuing with further evidence for the Copernican model, Slonimski detoured and expressed his frustration when discussing these issues with his co-religionists.⁷⁰ Slonimski declared that he could bring enough Copernican proofs to fill an entire book, but he contended that such an exercise was futile if the reader remained stubbornly convinced that only traditional beliefs could ever be correct. “Their ears refuse to listen . . . they think that all scientists have made errors, and that the truth only lies with them. Who can deal with them?”⁷¹ Although only twenty-five when he wrote these words, he found the parochial views of his peers contemptible:

These people have never before been illuminated with wisdom. They have been weaned from the breast of their mother and from there have moved on to a wife and children, and feel the burden of the need to work; what is the point of removing ideas that have taken root in their heart from the very day on which they were born?

...I know with certainty that would but one of these people show any interest at all and approach the gates of these sciences, were they to spend time studying in libraries, they would not raise even a single tiny objection about their foundations.⁷²

Slonimski's outburst reveals the frustrations of a mind rooted in the world of traditional Judaism, committed to its teachings and way of life, but aware that such a society was too often associated with a rejection of another world—that of science and experiment. Slonimski's entire corpus was an attempt to bridge this gap between traditional Jewish study and observance on the one hand, and the increasingly sophisticated findings of science on the other. In this book, which was only his second, the difficulties of the task that lay ahead were already apparent, and it is therefore all the more remarkable that Slonimski remained committed to this goal throughout his long life. Interestingly, in the second edition of *Kokhava Deshavit*, published in 1857, this paragraph was removed. Because Orthodox Judaism had not by this time realigned its attitude toward the outside world in general and the sciences in particular, the reason for this omission is most likely to have been a cooling of tempers that often comes with maturity. Perhaps Slonimski realized that he was unlikely to win adherents to the Copernican model if he painted all those who opposed it as uneducated boors or religious fanatics.

Slonimski also described the experiments performed by the French astronomer Jean Richer (1630–1696), who in 1671 to 1673 observed changes in the period of a pendulum as the latitude changes. This finding was correctly interpreted by Isaac Newton in his *Principia* as due to a decrease in the force of gravity with latitude, which could only be explained if the world was flattened at the poles.⁷³ Slonimski was awed by Newton's conclusion: "to this day any person who sails the sea of wisdom, when witnessing the amazing wonders discovered by this sage cannot but express with his mouth what he feels in his heart: Blessed be He who gives of His wisdom to flesh and blood!"⁷⁴

After a planet-by-planet description, Slonimski returned to what should have been the main subject of the book, the nature of comets in general and Halley's Comet in particular. He described some of the astronomers whose findings helped explain what comets were, and ended his book with a description of the expected path of the comet. It would pass by the Earth, then circle behind the Sun, and reappear sometime in March 1836, after which

it will continue along its path gradually becoming dimmer to the inhabitants of the Earth as it follows its orbit, until it will reappear again in the month of Shevat, 5662 [February 1902⁷⁵]. May it be then as a sign and wonder for our children after us in the Holy Land. Amen.⁷⁶

That Slonimski's book ended on a profoundly religious note—the desire for the ingathering of the Jewish people in the land of Israel—should not be surprising, for it was both a work of scientific discovery and religious affirmation.

It explained the work of Copernicus, Kepler, Newton, and Halley, while never questioning for a moment the existence of a Creator or the truth of the Torah. In fact, Slonimski pointed out on the very first page “when a person surveys this field [of astronomy,] his eyes cannot but behold the truth of God.”⁷⁷ In this way, Slonimski followed the path of those whose works he explained; Copernicus, Kepler, and Newton were profoundly religious thinkers whose scientific discoveries only strengthened their religious beliefs.⁷⁸ He categorically rejected the possibility that science could threaten Jewish beliefs “...for both are true and given by the true God”⁷⁹—a position that echoed Galileo’s remark: “the holy Scripture and nature derive equally from the Godhead, the former as the dictate of the Holy Spirit and the latter as the most obedient executrix of God’s orders.”⁸⁰

As mentioned above, in 1857, some twenty years after it first appeared, Slonimski published a second edition of *Kokhava Deshavit*.⁸¹ This second edition differed in many aspects from the first, and these differences demonstrate how Slonimski continued with the struggle to educate other Jews about the truth of the Copernican system. We have already noted one significant change, namely the removal of a passage highly critical of the narrow-mindedness of traditional Jews. Just as significant was the inclusion of two recent findings that further supported the Copernican model. The first was a description of Foucault’s pendulum, which had gripped Paris in 1851.⁸² “In a visible and tangible way the pendulum itself shows that the Earth moves... so that every person can see it in reality and be struck with awe at how the Earth continuously moves eastwards under their feet.”⁸³ The second finding was the discovery of the planet Neptune by the French mathematician and astronomer Urbain Jean Leverrier (1811–1877). Leverrier had noted irregularities in the orbit of Uranus and suggested that these were caused by the gravitational pull of a nearby but-as-yet-undiscovered planet. Observers, guided by Leverrier’s calculations, pointed their telescopes to a region where the planet should be found, and in September 1846, a new planet was indeed discovered and named Neptune. Slonimski described this finding not because it proved the truth of the Copernican model (since it had no bearing on the heliocentric theory), but rather because it demonstrated “the strength of the true foundations of astronomy.” His joy at the discovery is evident:

The findings of this amazing discovery have struck every wise person with awe. Nothing like this in the history of humanity has ever occurred since God created man on the Earth. For can a person sit at home and use his human mind to calculate and then find a completely hidden celestial object thirty-six times as far away as the Sun is from the Earth? Yet indeed he can point to the sky and say “look, aim your telescopes there. That is where you will find another planet that orbits

the Sun together with us, a planet that has been completely hidden from the inhabitants of the Earth until now.”⁸⁴

Even contemporary historians have noted that there was something quite extraordinary about Leverrier’s discovery. The account of the Dutch historian Antonie Pannekoek (d. 1960) reads as though it borrowed from Slonimski’s description:

This course of events made a deep impression on the world of scientists, but no less on the world of educated laymen. From all countries honours were showered upon Leverrier, and the discovery at a desk of a body never seen was the ruling topic for a long time. It was in this mid-century that science came to dominate the world concepts of the middle class in Western Europe, and in a spiritual struggle gradually superseded the traditional biblical ideas. A number of popular books on science, by spreading knowledge, furthered the Aufklärung (‘enlightenment’); welcomed enthusiastically among intellectuals and laymen, they served as an aid in the fight against antiquated political and social ideas and institutions. In such an environment this unexpected demonstration of the power of science and the certainty of its predictions came like a brilliant ray of light to strengthen the fight against darkness. Surely the astronomers were right who pointed out that any of the hundreds of computed perturbations used in the planetary tables, whose exactness was confirmed by subsequent observation, was as strong a demonstration, silently repeated every day, of the truth of science.⁸⁵

The overlap between these two independent descriptions is remarkable and adds veracity to both. And once again, despite Slonimski’s excitement at what the scientific method could achieve—in this case, the discovery of a hidden planet—his Jewish observance remained untouched. In fact, he added a phrase into his description that reminded the reader of this. Although the discovery of Neptune might suggest that the remarkable achievements of science proved its superiority over religion, Slonimski saw it as yet another example of the marvels of God’s creation: “Nothing like this in the history of humanity has ever occurred *since God created man on the Earth.*”⁸⁶

Slonimski’s Influence

Among those deeply influenced by Slonimski’s efforts at explaining science and astronomy from within a traditional Jewish worldview was Abraham

Warshavsky (1841–1901). Warshavsky was born in Odessa, a city he described as “the most beautiful of all, and one full of intellectual life and access to works of literature.”⁸⁷ His parents evidently indulged his thirst for education, and although much of his time was involved with business, his first love remained his intellectual pursuits. He was pained at what he perceived was a lack of adequate Hebrew-language science books that were available to his fellow Jews and so set about writing what he hoped would be a three-volume Hebrew-language work on astronomy, geography, and atmospheric. ⁸⁸ Only the first of these was published. Titled *Hakirei Tevel (An Examination of Nature)*, it was a comprehensive review of astronomy based on several contemporary works written in German, Russian, and French. ⁸⁹ Warshavsky also acknowledged the work of several Hebrew-language writers, of whom he was most indebted to Slonimski. He had read Slonimski’s *Kokhava Deshavit* and lavished praise on him for his journal *Hazefirah*: “May God strengthen this most valuable sage, who is true to the house of Israel; may he strengthen his arms so that he may continue to glorify wisdom in Israel and all humanity!”⁹⁰ And Warshavsky outlined a heliocentric solar system without any reference to Copernicus. It was assumed as fact and described as such.⁹¹

Although the body of Warshavsky’s book did not directly mention God or refer to a divine handprint on the natural world, the author clearly saw his work as having a profoundly religious agenda.⁹² The title page explained that the book was about astronomy and the natural world “from the day that God spoke,” and a later title page carries an epigraph from Isaiah: “Lift up your eyes and see who created all this,” leaving no doubt as to the impression the author hoped to achieve. ⁹³ In the introduction, Warshavsky was even more explicit in clearly stating his religious beliefs. “How sweet is the glorious endeavor,” Warshavsky wrote,

that God has given to mankind, to investigate all that is hidden. [To search for] all the good that is secretly hidden in nature’s storehouse, and the light that is sewn in the natural world for those who fear God and contemplate his name. Wherever [man] may turn, he will see the wonder that is creation and the life that exists within. Wherever [man] looks, he will observe the works of God and his infinite strength and wisdom that cannot be fathomed...eventually he will reveal that which is inscribed into the natural world, and he will lift the veil that lies over nature’s secrets. He will solve the riddle and reveal just how God has worked.⁹⁴

Warshavsky realized that his endeavor could be interpreted as pitting religious truths against scientific facts; consequently, he explained that this was

certainly not his intention. His introduction ended with a statement of his religious worldview in which there could be no contradiction between the truths of religion and science. In this way, he followed Slonimski's example, seeing both the Torah and scientific discoveries as emanating from one divine source:

Truth is a unity, all of it fitting together; one part cannot contradict another. Religious faith and [scientific] understanding must advance as if joined together, and neither can endanger the other. Anything that contradicts the intellect is certain to be false and not to be believed, and those scientists with integrity have already acknowledged that all the words of our holy and pure Torah are true and that they are all refined and logical....

Warshavsky did not publish either of the two further volumes on the natural world that he had promised to his readers, but his work is an important vision of the unity of the scientific and the religious. His role model, Hayyim Slonimski, died at the age of ninety-four, having spent his life committed to teaching all manner of science to the Jews of Poland, Russia, and beyond. But Slonimski's personal example of living an integrated worldview was not an easy path for his contemporaries to follow, even if today it would be considered a suitable role model for Modern-Orthodox Jews. Within his own family, his model was rejected; Slonimski's son Leonid converted to Christianity, a decision that, while common in Eastern Europe, would surely have been seen by Slonimski as a rejection of his own lifestyle.⁹⁵ Predictably enough, there was also opposition to his rationalist approach from within the Orthodox community: Two books were published repudiating Slonimski's position that the miracle of *Hanukah* had a rational explanation.⁹⁶ And although the Copernican model had become scientifically accepted beyond question, Slonimski's heliocentric position was also not without its critics. It is to that criticism that we now turn.