

The Unification of Torah and Science: Basic Principles and a Case Study on Electromagnetism

Part 11—Chashmal

In the previous chapter we examined the history of electromagnetism from a secular point of view. By identifying the principal stages of discovery with their corresponding *sefirot*, we have brought this aspect of science one step closer into the realm of sanctity. We will proceed to develop our understanding of electromagnetism even further, by turning to study electromagnetism as it appears in Torah sources.

The most important objective of studying science through the prism of the Torah is to discover the correct Hebrew term that describes the phenomenon under study in place of current scientific nomenclature.¹ This allows faith to enter freely through the veins and arteries of science, which are currently blocked to a large extent because of the subconscious opposition aroused by scientific terminology. As we mentioned above, revealing the true mission of science depends ultimately on words and numbers. The modern Hebrew word for electricity, *chashmal* (חשמל), is a fascinating example of a correct choice of

¹ In the final chapter of this volume we will continue to discover Hebrew names for other physical phenomena related to electromagnetism.

nomenclature (although we would choose to use it for electromagnetism in general and not just electricity).

The origin of the word *chashmal* is in the Book of Ezekiel in the most esoteric description of the *Ma'aseh Merkavah*, "the Workings of the Chariot." The word *chashmal* itself suggests a dual nature, as the sages teach us that the two syllables of the word juxtapose "silence" (שח) to "speech" (מל). Since we have made the correspondence between copper and electricity, we can now see that the two-letter sub-root of copper (נחשת) is the first syllable of *chashmal*, closely identifying the electric force with the *chash* part of *chashmal*. This implies that the second part of the word, *mal*, relates to the magnetic force. Indeed, the *mem* of the word *chashmal* is one of the seven weak letters which are often dropped from the root. This leaves us with one letter, the letter *lamed*, which is the final letter of both *chashmal* and *barzel*, iron. The *lamed* is in fact far stronger in the word *barzel* than is apparent at first glance, for if we return to the four names of Jacob's wives, the initial letters of which form the word *barzel*, we will see that the letter *lamed* is common to them all (Bilhah, Rachel, Zilpah, Leah; the positional values of these four *lameds* in the order that they appear in the acronym *barzel* – 2, 7, 9, 12 – add to equal 30, the numerical value of the letter *lamed*! In addition, the *lamed* of Leah, her initial letter and the explicit *lamed* of

barzel, is the twelfth letter of the four names when written out in full, and 12 is the ordinal value of the letter *lamed* [meaning that *lamed* is the twelfth letter of the Hebrew alphabet]). The probability that four names will contain one common letter is very low, yet we see that it occurs here, against the odds. The letter *lamed* is the initial letter of Leah, who represents the highest level of science becoming *Torat Mashiach*, as explained above. The *mal* of *chashmal* therefore represents iron and consequently suggests magnetism.

Another beautiful idea pertaining to electricity is that electricity has three states, static electricity, direct current and alternating current. This is reflected in the breakdown of the word *chashmal* into a form in which the second syllable of the word is repeated, creating three syllables: *chash, mal, mal*. Industrial electricity began with direct current, however it became clear that alternating current is far more efficient and is able to cover longer distances. Direct current is a flow of electrons moving in one direction through the wire, while in an alternating current the electrons are moving back and forth. Yet, alternating current projects an electric field around the wire, which moves at the speed of light. Thus, even though the electrons in alternating current are moving at a much slower speed than the electrons in a direct current, since the alternating current produces a field that is moving at the speed of light, it is far more efficient.

This idea gives us a new perspective from which to read the verses in Ezekiel's prophecy, called, "the Workings of the Chariot." One of the most important verses of that chapter is "and the living beings run back and forth like a flash of lightning." Reading this verse with electricity in mind we can see that it is clearly referring to an alternating current, because it is explained explicitly in Chassidut that the living beings, are merely running back and forth, exactly as the electrons in an alternating current run back and forth, without advancing. The difference between these angels and human souls is that whereas the angels are just going back and forth, souls, in their alternating motion of "forward and rest," are constantly advancing. The result of this constant movement of the angels is "like a flash of lightning," a field that moves at the speed of light. This is an electromagnetic wave, the type of radiation that exudes from alternating current.