

Lecture 1

Introduction

In this series of lectures, we are going to connect the issues of modern physics with the inner dimension of the Torah. One of the benefits that we will gain from this study is ideas that can help us in our daily lives as Jews.

Modern science is counter-intuitive

The fact that science in the last 100 years has been developing in a direction that is counterintuitive says something to us. So our first topic will be counter-intuition. If this is the direction in which science has been going then it says something about the whole direction of humanity. On a different front, we are now expecting and looking forward to the imminent complete and true redemption by the Mashiach. Like science, the redemption that we are expecting will be counter-intuitive to the redemption that we have been expecting. So now let us try to intuit counter-intuition. Let us try to apply counter-intuition to our lives.

Counter Intuition in Kabbalah

Kabbalah understands counter-intuition in a much more sophisticated way than science. By counter-intuition, science means anything that runs against the grain of our common-sense. Thus, special relativity, general relativity, quantum mechanics, string theory, they all go against our common sense and therefore are considered to be counter-intuitive. The first insight that Chassidut gives us is that everything is relative. This is similar to the conclusion of the first major theory of modern science, relativity. Of course, that "everything is relative" applies just as well to the notion of counter-intuition as it does to anything else. What this means is that you cannot just make a blanket statement that counter-intuition is what goes against my common sense, because common sense itself is relative. Common sense itself is relative to the particular mind-space that you are in. In the language of Kabbalah, every mind-space is called a World.

Given any particular mind-space that I am in, consider that at the next higher level of thought things actually turn around and

turn out to be counter-intuitive to what I thought initially at the lower level. When we progress from World to World, which are actually levels of consciousness, we learn that everything that we held to be true previously turns over.

Whoever is familiar with our method of teaching knows that we are always looking for Kabbalistic models that correspond to the particular topic at hand. If the model indeed fits and corresponds correctly, then not only do we gain insight into the model but we immediately better understand the system under consideration.

The model that we would like to use to understand counter-intuition will indeed be based on the model of the Kabbalistic Worlds, specifically to the three lower worlds which are known as action, formation, and creation. Or, in Hebrew: *Asiyah*, *Yetzirah*, and *Beri'ah*.

We live down here in the world of action, or more exactly in the physical dimension of this world of Action. Above our world is the world of Formation and above that is the world of Creation. The common denominator of these three lower worlds is that in them everything has some consciousness, some feeling of being, which causes it to feel separate from the Almighty as absolutely One and Unique. Above these three worlds is the world of Emanation (*Atzilut*) in which there is no distinct self-consciousness at all; it is purely Divine and there is no separation (or feeling of separation) possible from the Creator.

So now what we are saying is that every World has its own level of intuition or "common sense." When some counter-intuitive insight appears in each of the three lower Worlds, in accordance with its level of common sense, what is actually happening is that there is a light from the World of emanation appearing in that lower World, and that is what is counter-intuitive. We hope that this will become clear through the scientific examples we will now give.

"The Opposite Makes Sense"

Science would like to tell us that as we progress from one level of understanding of nature to the next, we also feel that our common sense about nature is broken and needs to be replaced with some new understanding.

If this is indeed a true concept, we expect that it should have some idiom used in the Bible or in the Talmud by the sages to describe it. We find that the idiom for something that is against what you initially think it to be is "*ifcha mistabra*" (איפכא מסתברא) which literally means "the opposite makes sense." The opposite of what you initially thought to make sense is what

makes sense. This idiom is found 19 (חיה) times in the Babylonian Talmud.

The initial letters of this idiom are **אם**, which means 'mother.' Indeed, in Kabbalah, the mother represents the natural and common sense understanding, the *sefirah* of understanding (*binah*), which can indeed represent that which can be countered.

The father (**אב**) represents a direct intuition, one where you cannot have the experience of the opposite being true. Thus, the father principle in Kabbalah represents that insight which actually can never be overturned.¹

We mentioned that "*ifcha mistabra*" is a Talmudic idiom. When the Rabbis in the Talmud are debating something, then one Rabbi says "I think such and such," and then someone else comes and demonstrates to him that actually the opposite of what you thought is intuitive is true.

Interestingly, we find this phrase only in the Babylonian Talmud but not in the Jerusalem Talmud, or the Talmud of the Land of Israel.² The Babylonian Talmud is much longer than the Jerusalem Talmud. The difference between these two works is that the Jerusalem Talmud is very direct and to the point and does not include long arguments, but comes to its conclusions directly. The Babylonian Talmud, on the other hand, is very drawn out and argumentative in its style. It takes many arguments and counter-arguments until the final conclusion is arrived at.

In Kabbalah, the Jerusalem Talmud is said to represent the mindset of wisdom. Wisdom is the father principle. In the worlds, wisdom corresponds to the World of Emanation, where the Presence of God is absolutely clear and therefore a person does not feel himself to be separate. Mother realization, which is represented by the Babylonian Talmud, is the created mind, the created consciousness, which does have its initial concepts of what is right and what is wrong, and since there is self-consciousness, you can be wrong. Your first thought can be right and it can be wrong, in fact many times it is wrong. This is even true of a great sage whose initial intuition may be wrong, and not only wrong but completely the opposite of the truth, something that is made explicit through the argumentation described in the Babylonian Talmud. As we mentioned, this idiom of "*ifcha*

¹ We have stated that counter-intuition is an example of the world of Emanation illuminating the common-sense intuition on one of the lower three worlds. Indeed, the father principle corresponds to the world of Emanation, whereas the three lower worlds, whose common-sense intuition can be countered originate from the equivalent of the mother principle.

² Work on the Babylonian Talmud officially ended in the 6th century CE, while the Jerusalem Talmud was finished about a 100 years earlier.

mistabra" appears exclusively in the Babylonian Talmud—not once does it appear in the Jerusalem Talmud.

So this is a beautiful first correlation of the concept of counter-intuition to a Talmudic idiom.

We also mentioned that it appears exactly 19 times in the Babylonian Talmud. 19 is the numerical value of Chavah (חַוָּה), the first woman, who is referred to as the "mother of all life." So there is something essential that relates this idiom to the original female figure of the Torah. Chavah, or Eve, is the most representative of the mother principle.

Either this means that the woman is herself is the "*ifcha mistabra*" of the man. Or, it can mean something else: many times we speak of the intuition that a woman has. We even say that the womanly intuition is stronger than the man's. But, the womanly intuition is capable of suddenly reversing entirely. The woman herself can come to that realization. The female mind is tuned into intuition, but not always is that intuition correct and therefore she herself should be able to both believe in her intuition but also be completely open to reversing it by 180 degrees.

Counter Intuition and Teshuvah

Our methodology also includes looking at the numerical value, the gematria of words in Hebrew. The idiom "*ifcha mistabra*" is equal to 815, which also equals a "*Ba'al Teshuvah*" (בעל תשובה). A *Ba'al Teshuvah* is someone who has returned to the Almighty. Counter intuition means some switch, some 180 degree turn in one's consciousness. This is what is necessary for a real *Ba'al Teshuvah*. To return in such a manner requires that a person perform a 180 degree switch in his or her mind.

By Divine Providence, tomorrow night is the first of the month of Nisan, the month of our deliverance from bondage in Egypt. It is commonly agreed that this will also be the month of the future redemption by the Mashiach. Now, though Rabbi Yehoshu'a (who is the source of the saying that the future redemption will occur in Nisan) says that the future redemption is not dependent on us doing *teshuvah*, Maimonides rules that it is. It is thus explained in Chassidut that this *teshuvah* that Maimonides is referring to is a unique type of *teshuvah*, specifically relevant to the month of Nisan. This type of *teshuvah* is different from the *teshuvah* that we do during the High Holy Days in the month of Tishrei. The *teshuvah* of Tishrei is based on *hitchazkut* (strengthening) and *hishtaprut* (betterment) we try to rectify ourselves based on what we know to be wrong in our lives. A person does an account of what he is doing and knows that there

are things that he has to do differently. The normal sense of *teshuvah* is that I know what is wrong, I look at myself, and I ask whether I am ok. So, I try to improve based on what I know is wrong.

But, the *teshuvah* of Nisan has to do with *hitchadshut* (renewal). In Nisan we are seeking a new life, metamorphosis, not just a rectifying of the past. We are looking for a new mindset. I realize that I did not at all know what is right and what is wrong. Similarly, the *Ba'al Teshuvah* of today is completely different than the *ba'al teshuvah* of 100 or 200 years ago. A hundred or two-hundred years ago, a person would have had a basic Jewish education and would have been aware of everything that he was doing wrong, and would decide to change his actions. But, in our generation, *teshuvah* entails being actually reborn; understanding the world in a completely new way. We have to see things from a completely different perspective. This is the true essence of *teshuvah*. This is the type of *teshuvah* that is required for bringing the Mashiach.

As the sages say "In the month of Nisan we were redeemed, and in the month of Nisan we will be redeemed." Clearly, what this is saying is that the redemption is a counter-intuitive process. The *teshuvah* necessary for redemption is a *teshuvah* of counter-intuition. It requires us to rethink everything that we know, our entire perspective on life. I have to understand that my whole perspective on life was wrong. This is the *teshuvah* of Mashiach. So that is our first gematria. The phrase "*ifcha mistabra*" teaches us about the essence of the true "*ba'al teshuvah*."

Silence

We have brought a second *gematria*, a single word, that equals 815. 815 is the numerical value of the word "silence" (שתיקה). The most important phrase of the sages that uses the word "silence" is, "the fence around wisdom is silence." If a person wants to come to true intuition, he has to be totally quiet, totally silent. That is the fence that guards true intuition.

In Chassidut, silence is related to the word "*chash*," the first stage of a three stage process that leads to true sweetening. The function of silence is that it allows you to give up your previous understanding in order to ascend to a higher level of being. There is a famous story that when Einstein first taught his special theory of relativity, there were a lot of older scientists who said that it looks good on paper, but that they were already too old to get into this new way of thinking about the Universe. So, you cannot be too old. The function of

silence allows us to give up our old way of thinking about the world.

This is the most important thing that modern science (the last 100 years of science) has taught us: scientists were willing to make an existential leap of not just giving up on their common sense, but in abandoning what everyone thought to be true, like Newtonian mechanics, and Hamiltonian mechanics. All in order to really understand what is going on with the world. This is the moral of the scientific story of the last few generations. We have to open our minds, to be willing to change our mind sets (דפוסי חשיבה) in order to open up to a new spring, a new birth, which vis a vis everything we have thought until now, is entirely counter-intuitive.

This was the general idea. Now, let us turn to our first scientific understanding.

Counter-Intuition in Physical Theories

The counter-intuitive thinking inherent in special relativity is counter intuitive to the common sense, the initial intuition of the world of Asiyah (action). The counter intuition in General relativity is counter to the intuition of the world of Yetzirah (formation). And, the counter intuition of Quantum Mechanics is counter to the intuition of the world of Beri'ah (creation).

We will try to explain these seemingly complex and difficult theories of modern physics. Both theories of relativity originated from Einstein. Though from their names they seem to be stages of development of the same theory, nonetheless to this day, scientists consider them to be two distinct theories. Then there is Quantum Mechanics and finally string theory.

Now, string theory does not have the same essence of counter intuition that these first three ideas in science have. In that sense string theory is much weaker than the other three theories, even though it contains strange sounding ideas like 10 or 11 or 26 dimensions, it still lacks the same essence of counter intuition.

It is important to note that the first three theories are pretty much accepted across the scientific board, whereas String Theory is not. So again, each of the universally accepted physical theories of the twentieth century has a unique essence of counter intuition that lies at its core.

Clearly, each one of these three theories can be explained in many different ways, so we will take a single facet from each of these theories to demonstrate the counter intuition inherent in each one.

The Counter Intuitive Aspect of Special Relativity

In the world of action, the lower world in which we are living, we believe that we are moving, we are moving forward in life. The most intuitive thing about the world of action is that we think that everything is progressing. If I tell you suddenly that you are not moving at all. You are actually stagnant. That would be totally counter intuitive. In the world of Asiyah everybody is into action. Everyone is on the move, going to work, doing something. Now I come along and say to you that this is all an allusion. Motion is relative. You are judging your motion in relation to something else. But, really that is also in motion. And relative to you it is at rest. Really, there is only one thing that is in motion in relation to everything: that is light. And light is always moving at a constant velocity and all other things are moving at relative velocities which can actually considered to be like standing still, because relative to light they are not moving.

Let us say it in a slightly different way:

The very concept of space and time, which according to special relativity become one reality called spacetime, up until Einstein they were considered to be two things, and they were thought to be constant and unchangeable. They were thought to be the background of the events, the motions that happen within their framework. That was the way that Newton understood space and time. Space and time were simply the context in which everything takes place. Space and time do not contribute to and do not change because of the events that take place in them.

But what Einstein innovated was that space and time are not at all a context but are part of events and they are affected by events. If you are traveling at a very high velocity than time dilates and space gets shorter (the Lawrence effect). Time and space are thus variables, not constants. This immediately does away with many problems like the age of the universe, because time is relative. If you are going very fast, then time goes slower. If you are traveling at the speed of light then time stops altogether.

What Einstein speculated was that the only thing that is really constant is the velocity, the speed of light. It does not matter how fast you are going, light will always be moving away or towards you at exactly the same speed. Everything else, including spacetime, is relative, relative to the observer. This means that from being purely objective, space and time have become purely subjective.

This again, is counter intuitive to our intuition in the world of action. As we explained earlier, this counter intuition is descending from the world of Emanation. We are basing our notion

of the world of Emanation causing this counter-intuition in the lower worlds on a famous saying from the Magid of Mezritsch, that "the world of Emanation is also here," i.e., in the world of action. The reality of the world of Emanation descends into and is present in each of the lower three worlds. We will explain this more as we progress.

The Value of Counter Intuition

For a moment let's go back to the Talmuds. The Jerusalem Talmud, as we mentioned, does not mention the idiom meaning counter-intuition, whereas the Babylonian Talmud contains this expression ("*ifcha mistabra*") 19 times. Since the Jerusalem Talmud represents wisdom, its intuition is correct from the outset, there is no need to turn one's mindset. But, the sages of the Babylonian Talmud described themselves as being in the "dark" relative to the sages of the Jerusalem Talmud, so they have an initial intuition, but often it needs to be countered. So, now we might ask: which result is deeper? Which result is more essential? Is it the person who got it right from the outset, or the person whose initial intuition, his common sense was wrong, but then after he turned his head around he got it right? We might think that the one who gets it right from the outset is better off, or we might think that the one who went through a 180 degree switch in his mind is greater.

The truth is that this is the same exact question as the question disputed in the Talmud regarding who is greater, the person who is a tzadik to begin with, or one who becomes a Ba'al Teshuvah. According to the opinion that the tzadik is always greater than the Ba'al Teshuvah (Maimonides does not rule this way in his code of law), then the Jerusalem Talmud, which never experiences counter-intuition will always be higher than the Babylonian Talmud, which often has to experience counter-intuition. But, there is another opinion: that the Ba'al Teshuvah is greater. What this opinion is saying is that the second insight is higher than the initial correct insight. This is the same idea as that which is stated in Chassidut that the light that comes from the darkness is greater [than light that did not come from darkness]. It was good that your initial common sense was wrong just as long as you have enough power of "silence" which allows you to counter your intuition. Then it was worthwhile to have made the switch. The light that comes from the metamorphosis of turning your heart and mind around is like the Ba'al Teshuvah who can stand in a place that a perfect tzadik cannot stand. So this is an example of how the world of Emanation shines in the darkness of each of the three lower worlds.

Let us restate what we have seen:

Special relativity is total reorientation towards the universe. It does two things: it connects and unites matter and energy, by the most famous equation in all of science: $E = mc^2$. And, not only does it do that, but it also makes space and time part of the events, and not just the backdrop in which events occur. Meaning the space and time are relative concepts relative to the observer and the only thing that is constant is the speed of light.

Interestingly, nowadays in the most recent developments, scientists in trying to unify the four forces of nature, it seems that perhaps even the speed of light itself changes with time. Perhaps at the beginning of creation, the speed of light was much greater than what it is now. This would also explain millions of things in accordance with the Torah. This is an idea that is gaining more and more popularity, even though it still cannot be proven. For Einstein though, the speed of light is the one and only constant. The Rebbe taught us that all of the laws of nature are not necessarily constants, meaning that we cannot use extrapolation to assume that what we are measuring today is what always was. So you cannot say that the speed of light was always the same. The same is now being said by some scientists. In the same vein, the fine structure constant may also have changed.

To summarize, what special relativity says is that everything depends on the observer. This is counter-intuitive to the normal mind-set of the World of Action. What this boils down to is that a person could be running his entire life and in the end realizes that he has gone nowhere. The only one who is really going anywhere is one who is attached to light. If you are on a beam of light you are moving. Light is the Torah. This is the absolute counter-intuition in the World of Asiyah.

The Counter Intuitive Aspect of General Relativity

Now what about the World of formation (*Yetzirah*)?

General Relativity takes into consideration gravity, one of the four forces which we will explain later. It is the most elusive of the forces. But what Einstein realized is that from the experience of the observer, acceleration and the pull of gravity are equivalent to one another. This has very far-reaching consequences. The example that is usually given to demonstrate this is that if you are traveling up in an elevator, when the elevator accelerates, you feel yourself pushed down, your legs are pulled down to the floor. This feeling of being pulled down is identical to what you would feel in a gravitational field. This insight is the equivalence principle of General Relativity,

and is the basis of General Relativity. and has many far-reaching consequences. The most important consequence of the equivalence principle is that space is not flat, or in other words, it cannot be described by Euclidean geometry.

Until Einstein everybody envisioned space as being "flat." Thanks to Riemann's work, Einstein had the necessary mathematical "vessels" to express how space might be curved, which means that everything indeed goes in a straight line, while at the same time following the curvature of space created by the masses lying in it. Gravity, as Einstein realized, actually curves space. This concept of curvature is counter intuitive to our normal concept of geometry. After having studied geometry in high school, General Relativity requires us to re-conceive what space is like. Instead of space being flat it is either convex or concave.

What does this symbolize, that you take something that you thought was straight and now it is either convex or concave. This is called in Hebrew: כחומר ביד היוצר, meaning, "Like clay in the hands of the artisan." This is a deep insight into what the word "formation" means. The artisan has a potter's wheel, on which he places the raw material, the clay, and he curves it. In *Halachah*, a vessel that has no curvature, meaning it does not have an inner space, convex or concave in which it can hold something, such a vessel cannot be defiled (it cannot become ritually impure), thus this is not a vessel at all. The idea that spacetime itself has intrinsic curvature to it, is the absolute formative quality in the world of Formation. So what is being revealed here is that space is a malleable material, not at all what we thought that it is.

The Counter Intuitive Aspect of Quantum Mechanics

The counter-intuitive principle revealed in Quantum Mechanics is Heisenberg's famous "uncertainty principle." What it started out as is that we cannot know both the location and the velocity of an elementary particle at the same time. At first people thought that this was a limitation of the observer. But later it became clear that Quantum Mechanics is saying something much more profound. It is saying that in truth, in essence, a particle does not have exact position and exact velocity or momentum at the same time. This is not a limit about how we know things, but rather this is something built into the concept of a particle. This means that particles are no longer things, like Dirac said. Elementary particles, like electrons, are not things, they are wave functions meaning probability functions. There are many ways to mathematically formalize this.

Feynman, one of the greatest American Jewish physicists used to say that there are perhaps a few people who understand, who grasp what relativity is saying. But, there is no one at all who can fathom the meaning of Quantum Mechanics.

Let us go back for a moment to what we said that the counter intuition of the world of Formation says about our service of Hashem. In the world of *Asiyah* we said that the counter-intuition boils down to changing our comprehension of what motion is. This is what the prophet says that relative to everything a person is a walker, a mover. Relative to everything else, only a human being can really move because a person is on a beam of light.

In the world of formation, curvature is a statement about the human heart. The heart is not something flat, it is something that needs to be formed, that needs to be shaped (sometimes, it needs to be broken) in order to become a receptacle. You have to make your heart into a vessel. You have to be a craftsman, an artisan in order to make your heart into a vessel.

In the world of creation, uncertainty is a statement about the mind. The paradox of the mind is that things are no longer things. In Kabbalah it says that in the world of *Berih'ah* there are no longer things, there is only raw material. The mind has to divorce itself from thinking about 'things.' The mind has to reform itself completely around this idea of uncertainty which takes away our notion of things.