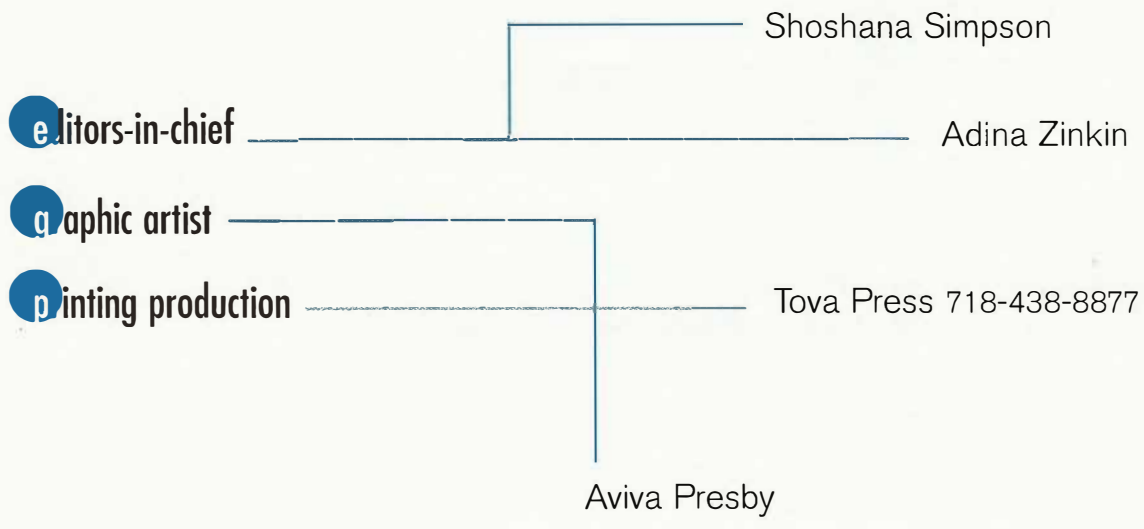


# Staff

# derech haTeva





# edication

We dedicate this year's Derech HaTeva journal in memory of Israeli astronaut Ilan Ramon and all the other crew members that perished aboard the space shuttle Columbia on February 1, 2003.

By showing the world that there is a place for both Torah and science, Ilan became a role model to us all.

# Thank you

We would like to extend our gratitude to the Office of the Dean, the Ivan Tillem Fund, the Torah Activities Council, and Dr. Lowengrub, Vice President for Academic Affairs, for their generous support in bringing this project into fruition.

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A Journal of Torah and Science

# derech haTeva

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**"Hafoch bah v'hafoch bah, d'cholah bah"**

**(Avos 5:25)**

**Delve in it [the Torah] and [continue to]  
delve in it, for everything is in it.**

**IN THE GEMARA (ROSH HASHANA 16A) RABBI YITZCHAK POSES** the question, "Why do we blow the shofar on Rosh HaShana?" and responds almost rhetorically, "Why do we blow? [Because] the Merciful One said -- 'blow!' "

The implications of this Gemara extend far beyond the laws of Rosh HaShana. In a culture where obedience is only respected if human understanding and appeal are its precursors, it is important to note that halacha often dictates that we act simply because doing so represents the fulfillment of Divine mandates. While personal appeal can enrich the performance of mitzvot, it is not a determinant of observance. Whether or not individual halachot appeal to human emotions or intellect, the Gemara in Rosh HaShana reminds us that, contrary to societal values, we observe because we are required.

Bearing that statement of the Gemara in mind, it is also interesting to note that our Sages teach us (Breishit Rabbah 1:1 ) that G-d "looked into the Torah and created the world." Existing a priori, the Torah is the blueprint of the Universe. The logical corollary of this is that all truths that exist in the realm of physical reality must be in consonance with Torah, for the latter is the source of their existence. It is not surprising, then, that performing G-d's many mitzvot not only affords us spiritual benefits but provides us with "tangible" existential benefits as well.<sup>1</sup> While research has often focused on the correlation between Orthodox Judaism and physical health benefits<sup>2</sup>, there is a body of research exploring the connection between observing the mitzvot and increased psychological well-being.<sup>3</sup>

# v'chai bahem:

the Psychological Health Benefits of Observing G-d's Mitzvos



## Eating Disorders

An estimated five million Americans suffer from eating disorders, with 90-95% of these disorders occurring in women.<sup>4</sup> Though wreaking havoc on the physical body, the root of these disorders is often culture-based and psychological. Researchers agree that disorders such as anorexia nervosa and bulimia occur almost exclusively in countries of affluence where food is present in great abundance.<sup>5</sup> In addition, studies have shown that societies with increased cultural pressure to be thin, as expressed through media adulation of increasingly thin role models, serve as breeding grounds for such disorders. "For most, the current standard of female beauty is unattainable," notes researcher Dr. Marci E. Gluck, and eating disorders are thought to arise when individuals realize the discrepancy between their ideal and actual sizes and experience dissatisfaction at this realization.<sup>4</sup>

While the Orthodox Jewish community cannot boast complete immunity from problems plaguing general society, the incidence of eating disorders in the Observant community still remains lower than in American communities of comparable socioeconomic status.<sup>6</sup> Research by Dr. Gluck and colleague Dr. Allan Geliebter sought to explore the impact of religion, specifically Judaism, on the "development of disturbances in body image and eating disorders." The findings of their correlational study confirm that secular women indeed have "greater body dissatisfaction and more overall eating disorders" than Orthodox Jewish women. In addition, they found that secular women experienced more shame about their body. Surprisingly, both samples of Orthodox and of secular women identified relatively similar

ideal body sizes, which led the researchers to conclude that media exposure alone cannot explain the differences between the samples' body dissatisfaction and related eating pathology. Internalization of the media messages must be present, they note.<sup>4</sup>

The researchers attempt to fit their data into a theoretical framework and suggest that "Orthodox Judaism might, to some extent, protect women against developing body dissatisfaction and eating pathology." Perhaps Orthodoxy provides women with a network of social support that can buffer against the spread of shame-induced eating disorders, they postulate. They suggest too that Orthodox Judaism may place less emphasis on the physical attractiveness of women and less pressure on women to achieve outside of the home. In addition, the researchers claim that these "protective aspects" of the Orthodox Jewish religion might also generalize to other groups such as the "Old Order Amish."<sup>4</sup>

It can be claimed that a more complete theory to explain the results might delve past the socio-cultural aspects of Orthodoxy and arrive at the source of all of the "protective" aspects of Orthodox Judaism, its laws. Specifically, the laws of tzniut and its methodological underpinnings provide various buffers and benefits to its adherents.

There are numerous "reasons" for the Torah's injunction for women to dress in accordance with the laws of tzniut. One overarching reason that can be derived both explicitly and implicitly from Torah sources relates to the issue of female dignity and role. As a representative of the Jewish home and spiritual trendsetter, the Jewish woman must be cognizant of her royal role and must dress accord-

ingly. She must recognize and be acknowledged for her spiritual and intellectual capacities and for her integral role in the continuity of Torah. The Torah recognizes the power and holiness of the human body and the possible degradation that can come from inappropriate physical exposure. The laws that limit such exposure are, in effect, promoting female dignity and preventing the debasement of the regal status of the Jewish woman.

The Gemara (Yoma 47a) relates the story of Kimchis, a woman whose seven sons all served in the High Priesthood in the Temple. When asked how she merited seven sons who individually achieved spiritual ascendancy, she responded "[Because] never did the walls of my house see the braids of my hair." Many interpretations are offered as to the connection between her meticulous act of hair covering and the nobility of her sons. Rabbi Chaim Shmulevitz, zt"l, of Mir, proposes a fascinating explanation that touches upon many of these explanations with a bit of a humanistic twist (Sichot Mussar 1972 2:15). He explains that the meticulous act of hair covering of the wife of Kimchis stemmed from her intense feeling of "nechbadut," which denotes "self-respect" and connotes royalty. Possessing a keen sense of dignity for her soul and the human form entrusted to protect it, she felt that even the walls of her own home should not be allowed to see her crowning glory, her hair. The laws of tzniut were a natural expression of her self-worth; for when something is beloved, it is concealed. In this we see the expression of the Torah principle noted in Bava Mezia (42a), "The blessing is not found except in something that is hidden from the eye."

In addition, the laws of modesty emphasize the Jewish ideology that



the human body is a means to an end and not an end within itself. King David describes the female portion of the "Kingdom of ministers and [a] holy nation," (Shemot 19:6) as bearing a hallmark of internal magnificence, "All of [her] honor of a Princess is inside, more so than her [external] golden garments" (Tehillim 45:14). Spiritual qualities that emerge from the refinery of internal toil and struggle are valued by Torah above physical beauty: "Grace is false, and beauty vain; a woman who fears Hashem, she should be praised" (Mishlei 31:30).

The laws, it emerges, have the power to imbue nobility and aristocracy within its adherents as well as transmit the message that human value is not determined by physical endowments. It follows then that the "internalization of socio-cultural attitudes,"<sup>4</sup> which promotes body dissatisfaction, as well as disorders that arise from distortions in self-perception, would be less prevalent among those who live by the laws of tzniut.

#### Catharsis

Another area in which scientific data has given us a small glimpse of the psychological benefits of heeding G-d's commands is in reference to the theory of catharsis. Originating in Poetics by Aristotle and later revived in theory form by Sigmund Freud, "catharsis" is the belief that "acting aggressively or even viewing aggression is an effective way to reduce anger and aggressive feelings."<sup>8</sup> Freud posits that frustration leads to anger and that repressed anger creates hydraulic pressure within the individual that requires release for relief.<sup>7</sup> This buildup of hydraulic pressure and repressed emotions, Freud believed, could cause psychological

ills, such as hysteria or phobias, and avenues to vent such emotions should be sought.<sup>8</sup>

Understandably, this theory garnered popular support, as our "default" as humans is to relent to our emotions. The catharsis theory not only permits such activity, but it infuses these venting practices with scientific credibility.

In opposition to this theory of unregulated venting stands the Torah perspective. Self-control is one of the cornerstones of the Jewish religion and the Jewish hero is "one who conquers his [evil] inclination," and demonstrates internal control (Pirkei Avot 4:1). In addition, virtually all expressions of anger are considered abhorrent and are likened to idol worship (Iggeret ha-Ramban and Rambam Hilhot De'ot, Shulhan Aruh). Consistent with the ideal of internal restraint is the

tic expressions of grief and the Torah, in its wisdom, prohibited such self-destructive displays. The Torah recognizes that actions effect cognitions and even seemingly innocuous activities such as cursing the deaf, are prohibited on grounds that they might accustom us to act inappropriately (Vayikra 19:14; Rambam cited by Sefer HaChinuch mitzva 231; and Sefer HaChinuch mitzva 16).

Ostensibly, these sources would appear to present a conflict with science, for the Torah seems to be denouncing cathartic actions that psychology might term health-promoting. As established earlier, however, it is impossible for Torah to be in conflict with physical reality, for Torah is the source of all reality.

After separating true scientific findings from popular belief, it emerges that psychology and Torah

**The Torah laws that limit physical exposure are, in effect, promoting female dignity and preventing the debasement of the regal status of the Jewish woman.**

Gemarah in Yoma (23a). There we are told that one can receive the title of "lover of G-d" by exercising restraint in emotionally trying situations. Specifically, "Those who are insulted and don't insult back, those who hear their shame and do not respond."

Furthermore, the Torah forbids extreme expressions of mourning such as "gedidah" and "simat karcha"(Devarim 14:1). It can be argued that these represent cathar-

tic expressions of grief and the Torah, in its wisdom, prohibited such self-destructive displays. The Torah recognizes that actions effect cognitions and even seemingly innocuous activities such as cursing the deaf, are prohibited on grounds that they might accustom us to act inappropriately (Vayikra 19:14; Rambam cited by Sefer HaChinuch mitzva 231; and Sefer HaChinuch mitzva 16). Ostensibly, these sources would appear to present a conflict with science, for the Torah seems to be denouncing cathartic actions that psychology might term health-promoting. As established earlier, however, it is impossible for Torah to be in conflict with physical reality, for Torah is the source of all reality. After separating true scientific findings from popular belief, it emerges that psychology and Torah



tal group release their anger. Physiological measures as well as personal reports revealed that aggression was still present after cathartic activities.<sup>9</sup>

Common consensus among researchers is that while cathartic activities may decrease or appear to decrease aggressive feelings short-

term, in the long run, engaging in cathartic acts leads to an increase in aggression and aggressive acts.

It should not come as a surprise that the Torah's laws and hashkafot are in line with the true psychological research findings on catharsis. Nor should it be surprising that the laws of modesty afford its adherents psycho-

logical benefits and protective mental buffers. The Architect of the laws is the Craftsman of the human psyche as well, and so the symbiotic relationship between the two is not merely coincidental but imperative.

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**WITH THE GROWTH OF MODERN MEDICINE, FERTILITY TREATMENTS,** and assisted reproductive technologies, multiple births have become more common. Yet, twins and triplets have been around since the world began. Throughout Tanach, the Talmud, and early rabbinical sources, there have been numerous cases of multiple births. Twins, specifically, have come in several forms, monozygotic, dizygotic, and conjoined. There have even been cases of twins born months apart.

In dizygotic twins, commonly known as fraternal twins, the mother's ovaries release two eggs at or about the same time and a separate sperm fertilizes each egg. As a result two zygotes are formed, each with its individual genetic composition. The twins develop in utero in two different amniotic sacs, each with his or her individual placenta and chorion. Fraternal twins may be the same sex or one of each sex and the twins are related to each other genetically no more than any two siblings who are not twins.<sup>1</sup> In monozygotic or identical twinning, an egg is fertilized by a single sperm, forming one zygote. As the fertilized egg divides into two cells, the two cells lose contact with one another and form two separate zygotes. The zygotes then develop into two distinct embryos, each with its own placenta in the mother's womb. Identical twins form before the embryo implants in the wall of the uterus, which is about ten days after conception.<sup>2</sup> These twins are genetically identical to each other and by extension must always be the same sex.

# A look at twins

in Jewish History



The very first birth described in Tanach is the birth of Cain and Abel, the two sons of Adam and Eve. In Bereshith Rabbah (22: 2-3) Rabbi Joshua b. Karhah said that Cain was born with a twin sister and Abel with two twin sisters. This idea of Rabbi Joshua is supported by the verse in Bereshith (4:2) "And again she bore his brother Abel." The words "And again she bore" implies an additional birth but not an additional pregnancy. The twins born to Adam and Eve were undisputedly fraternal being as the sexes of the twins were different. As an interesting aside, the Shelah (Tractate Pesachim, Drush 3, Shabbas HaGadol) mentions that the twin of Abel was reincarnated in Tzipporah, the wife of Moshe.

The next set of twins found in Tanach, and the very first twins explicitly described, is Jacob and Esau born to Rebecca. The simple reading of the text seems to infer that Jacob and Esau were dizygotic, or fraternal. "The first one emerged red, all of him was like a hairy mantle..." (Bereshith 25:25). Esau was hairy and red and Jacob was not. These different phenotypes seem to indicate that in fact Jacob and Esau were fraternal twins, who each possessed a different genetic makeup. However, a problem arises when the scripture then describes the birth of Jacob, "...his brother emerged with his hand grasping onto the heel of Esau..." (Bereshith 25:26). This emergence from the womb together seems to suggest that they shared a single amniotic sac, an indication that they were monozygotic and not dizygotic.<sup>3</sup>

As early as the twelfth century, Abraham Ibn Ezra was puzzled by this apparent contradiction. He concluded that they were in two different amniotic sacs, which ruptured simultaneously (Ibn Ezra, Bereshith 25:

25), thereby suggesting that the twins were pseudo-mono-amniotic, with the dividing membrane rupturing prior to birth. Although uncommon, this is nevertheless possible. Additionally it is possible that the birth of Jacob occurred very soon after the birth of Esau. This allows for the possibility that Jacob was in fact able to grasp onto the heel of his brother before Esau cleared the birth canal.<sup>4</sup>

There is, however, a theory that Jacob and Esau were monozygotic twins and therefore shared a single amniotic sac. The sharing of a single amniotic sac clearly explains how it was that Jacob was able to hold on to the heel of Esau during the birth. Yet, this idea is apparently contradicted by both the physical and personality differences between them. Identical siblings should be just that, identical. While their personality differences can be explained by developmental and environmental differences that play a role in the formation of a personality, their physical differences cannot be as easily explained. One possible explanation is that the twins resulted from the condition known as twin-twin transfusion syndrome, in which identical twins, living in a single amniotic sac, experience abnormal blood circulation as a result of an abnormality with the placenta. In normal fetal development the fetus exchanges oxygen and carbon dioxide with the mother's circulation via the placenta. In this disorder the artery from one fetus distributes blood into the placental cotyledon, which is then drained by the vein of the next fetus. This may cause one of the twins to be born with two many red blood cells, and as such he may suffer hypertension and an enlarged heart, which may lead to death from heart failure. The other twin will not get enough blood and may die from severe ane-

mia. The first twin is bigger and redder at birth and may be of a lesser intelligence and more aggressive. The second twin is usually smaller and paler. These descriptions seem to fit the scriptural descriptions of Esau and Jacob, respectively.<sup>3</sup> However, this theory addresses only the difference in color and not the difference of hairiness between Esau and Jacob.<sup>5</sup> This being the case, it is probably more plausible to conclude that Jacob and Esau were dizygotic twins.

The next set of twins that appear in Tanach is in the story of Tamar, the daughter-in-law of Judah, who gave birth to twin boys, Pharez and Zerah. One distinction between Tamar's twins and Rebecca's twins is that Rebecca knew she was carrying twins during her pregnancy while Tamar did not. As it says in Bereishith 38:24, "and behold she is pregnant by harlotry." There is no mention of twins until their birth. Being that the midwife was prepared to apply a red thread to the baby that came out first, she must have made the diagnosis of twins just prior to delivery. As the phenotypes of Pharez and Zerah were not discussed in the text of Bereishit the possibility of monozygotic twins cannot be excluded.<sup>4</sup>

Although not explicitly mentioned in the Torah, Chazal tell us of other Biblical twins. The Talmud in Babba Basra 123a says that a twin sister was born with Dinah, the daughter of Jacob and Leah, as well as with Benjamin, who the Talmud specifically mentions was born with a twin. Tosaphot there comments that the heads of all the tribes were born with a twin. Rashi in Bereishit 38:17 also mentions that all the tribal heads had a twin and that Benjamin had two twin sisters, i.e., triplets. Additionally, it is mentioned in Seder Olam that Leah



and Rachel were twins. One possible source for this is in the Talmud (Babba Basra 123a), which says that Leah had soft eyes from crying because people said that Rebecca had two sons and Laban had two daughters, the elder son for the elder daughter and the younger son for the younger daughter. This statement in the Talmud implies that the age difference between Leah and Rachel parallels that difference between Esau and Jacob, i.e., just as Esau and Jacob were twins so were Leah and Rachel.<sup>6</sup>

Another type of multiple birth is that of conjoined twins. Conjoined twins, or Siamese twins, are monozygotic twins that do not fully separate from each other due to the incomplete division of the single fertilized ovum. The two twins will be connected at certain points on their bodies; they may share tissues, organs, or limbs. Conjoined twins are rare with an occurrence rate of about one in every eighty five thousand births. The survival of conjoined twins depends greatly on their point of attachment and on which organs, if any, are shared.<sup>7</sup> About forty percent of conjoined births are stillborn and another thirty percent die within twenty-four hours of birth. Interestingly, the incidence of female conjoined twins is higher than that of males.<sup>8</sup>

Rabbi Jacob Reisher, whose responsa was published in 1709, commented on a case of non-Jewish male conjoined twins. He then remarked that this is not a novel phenomenon and quoted a Talmud in tractate Eiruvin 18a that Adam and Eve were created simultaneously as fully formed, yet conjoined individuals, and only later separated. Rabbi Reisher uses this Talmudic

case of Adam and Eve to claim that according to halacha conjoined twins are separate individuals and even in their conjoined state are referred to in the plural, "Male and female did he create them..." (Bereishith 5:2).<sup>9</sup>

The Talmud in Menahot 37a relates the story of a question being asked about the requirement to give five selaim (approximately five silver dollars) to the priest for a first-born baby with two heads. Elijah the prophet (as per Tosaphot in Chullin 6a) ruled that the two-headed baby be treated as two individuals and that ten selaim be given to the priest.

Throughout the centuries there have been other halachic questions posed regarding conjoined twins. Can such twins marry? How much of an inheritance do conjoined twins get vis-à-vis other siblings in the

ered one of the heads of the two-headed child, and then poured the water on the other head. Both heads screamed in pain and, as such, Solomon ruled that the two-headed twin should be considered one person. Aside for this account of King Solomon, other literature on conjoined twins does not describe such twins sharing a common nervous system and, thus, in such a conjoined twin both heads would not respond to the same painful stimulus. Being as this is the case halachic authorities, including the Shittah Mekubezet, conclude that conjoined twins be considered two individuals. However, even after concluding that conjoined twins are two individuals, there are still halachic problems for conjoined twins to marry.<sup>8</sup>

The most tragic case of conjoined twins occurs when the two infants

**A** Adam and Eve were created simultaneously as fully formed, yet conjoined individuals, and only later separated.

family? All such questions really are under an umbrella question of how does Torah law view such twins; are they considered one person or two? The Tosafot quotes a midrash that the Devil Ashmedai brought a set of conjoined twins in front of King Solomon. Ashmedai said that the two-headed man married and had a normal child and a two-headed child, who want a double portion of the inheritance. The midrash continues that Solomon heated water, cov-

share a common heart. Without surgical intervention both such twins are doomed to death, as the heart mass is not enough to sustain proper circulation to both bodies. No twins joined at the heart have survived more than nine months. Separation in this case is basically an amputation of one twin, as one twin must be sacrificed so that the other can live. The first such case to receive widespread attention was reported in Children's Hospital in



Philadelphia in 1977 and the physician involved was Dr. C. Everett Koop.<sup>8</sup> The conjoined twins together had one and a half hearts, which was strong enough to support only one child. Medically, it was clear what had to be done. The entire six-chambered heart had to be given to one of the babies.<sup>9</sup> Additionally, one of the babies had another circulatory defect, which would not allow her to survive any length of time, even if she were given the heart.<sup>10</sup> These children were born to a deeply religious Orthodox Jewish family who would not allow surgery to take place without the proper rabbinical support. The rabbinical authority they turned to was the prominent Rabbi Moshe Feinstein, dean of Tifereth Jerusalem seminary in New York City. Rabbi Feinstein concluded that the parents should go ahead with the surgery and as such Dr. Koop and his extensive team separated the two babies, placing the single heart in the chest of one baby, allowing that baby to live and the other to die.<sup>9</sup>

In halacha one life is not to be sacrificed for another, one exception to this rule is sacrificing the fetus in order to save the life of the pregnant mother. The Mishna in Ohalot (7:6) says that if a woman's life is in danger during childbirth, one may surgically destroy the fetus to save the mother. However, if the head of the fetus is already delivered, than one may no longer intercede even if the mother's life is at risk. The Talmud in Sadhedrin (72b) poses the following question on the Mishna, why can't one kill the infant whose head had been delivered and thereby save the mother? Why isn't the infant considered like a pursuer and as such the law of pursuers takes effect, which permits one to kill the pursuer to save the intended victim? The answer given is that this sit-

uation is considered an act of G-d, with G-d being described as the pursuer, as the partially delivered baby is not knowingly trying to harm the mother. Only when the entire fetus is in utero and totally dependent on the mother to live can the fetus be sacrificed. Maimonides explains this as "natural law," in that both the death of the mother and the death of the fetus will result in the same outcome, a non-viable fetus. This complete dependency on the mother is the reason for giving the mother's life priority to that of the fetus, as she is the source of fetal life. However, once the child's head appears and it can breathe independently and it is a separate entity from the mother. At that point we cannot destroy one life for another.<sup>10</sup>

Rabbi Feinstein used this same logic to explain his ruling in case of the conjoined twins. The second baby had no independent way of surviving; her entire survival was dependent on her sister. Without the surgery both would have died. With no independent means of survival, the second baby became halachically classified as a pursuer and, as such, her life could be sacrificed.<sup>10</sup> Rabbi Shabtai A. Rappaport clarifies this idea by saying that one twin's life was clearly going to be brief and the other twin's life was potentially long and healthful. Thus, the weaker baby endangered her sister with the loss of a full life and is therefore undeniably a pursuer.<sup>11</sup> The problem Rabbi Feinstein encountered with this explanation was that Maimonides uses the phrase "natural law" which easily applies to a woman in childbirth, but might not apply as easily to Siamese twins. Based on this, a second explanation was presented to Rabbi Feinstein to which he gave his approval.<sup>10</sup>

The Talmud Yerushalmi, Terumot

(8:4) derives a halachic ruling concerning a caravan of Jews surrounded by gentiles. The gentiles, capable of destroying the Jews, offered the following deal. If the Jews would give over one man to be killed, then everyone else would go free, otherwise all the Jews would be killed. The halacha is that it is forbidden to hand over one man. Yet, if the gentiles selected one particular man, then he can be turned over to save everyone else. In the Talmud there is a dispute as to whether the man selected has to be guilty of death in order to be able to hand him over. Maimonides in Laws of Foundations of Torah 5:5, says that to be able to hand him over to the gentiles, the selected person must be guilty of death. With these conjoined twins, the weaker baby could not live and it appeared as if G-d Himself issued a ruling of death for that infant. Therefore, the decision to sacrifice her is consistent with the opinion of Maimonides,<sup>10</sup> although prominent rabbinical authorities objected to the reasoning behind the ruling of Rabbi Feinstein.<sup>8</sup>

Usually twins are born within minutes of each other, yet sometimes it can happen that they are delivered days or even months apart. Delayed twins are uncommon, but not unheard of. The usual sequence of events in these cases is that one twin is born naturally, but prematurely, and the second twin is not ready to be delivered. Therefore, doctors may decide to delay the delivery of the second child so it reaches viability. The longest recorded interval between a set of delayed twins has been five months. Due to prematurity, neonatal death of the first twin is common, but it is not always the case.<sup>12</sup>

According to the British Journal of Obstetrics and Gynecology, Carson first described a case of delayed

twins in 1880.<sup>12</sup> The Talmud described a case of delayed twins much earlier. In the Talmud Niddah (27a) Rav Acha the son of Rav Avira said in the name of Rabbi Yitzchak that that there was an incident in which a child was born thirty-three days after its twin. The Talmud continues and says this is possible if one child was ready to be born after seven months and the other child was ready after nine months. Rav Avin bar Rav Adda says in the name of Menachem of Kefar Shearim that in fact the twin sons

of Rav Chiya, Yehudah and Chizkiyah, were born three months apart. This incidence of the twin sons of Rav Chiya is also mentioned in Yevamot 65b.

Thus the phenomenon of multiple births of all types has been around since the world began. It has been documented throughout the Tanach, the Talmud, and subsequent halachic writings. Especially for the case of conjoined twins, many halachic questions have been raised, such as those regarding issues of inheritance, first born rights,

individuality, and the permissibility of medical intervention. Once again the Torah provides us with evidence for the truth of the famous statement made by King Solomon in Ecclesiastes 1:9, "What has been is what will be, and what has been done is what will be done, and there is nothing new under the sun."

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**THE RAMBAM IS QUOTED BY HIS SON, RABBI AVRAHAM, IN THE** introduction to the sefer, Ein Yaakov, as having said that one must always pursue the highest quality medical consultation, technology, and treatment.<sup>1</sup> However, can this statement of the Rambam be expanded to all fields of science? The application of scientific information reaches far beyond the medical realm. In fact, scientific knowledge has effectively gained an important role in the legal world as well. Whether halacha sanctions the merging of these two fields of study is a question that faces many poskim of the day. The most current issue being the use of DNA evidence as a means of identifying the many individuals lost in the tragic fall of the World Trade Center, as well as the many body parts recovered after unfortunate suicide bombings in Israel.

In Devarim 17:9, the Torah teaches, "al pi shnayim aidim yakum hadavar," that through the word of two witnesses shall the matter be established. However, the Gemara in Kesubos 16a introduces the concept of "yediya b'lo reiya," that at times a judge can base his ruling solely on personal knowledge, without the testimony of any witnesses. The Rambam in Hilchos Gerushin 13:29 and the Mishnas Avraham delineate certain conditions as to when two witnesses are necessary. Witnesses are only needed when there is an element of doubt with regard to the case and therefore clarification is required. However, if all matters are apparent and straight forward, then testimony by witnesses is obviated. The Chelkas Yaakov 2:31, formulated a teshuva allowing an aguna to remarry on the basis of yediya b'lo reiya. The question that many rabbanim contemplated is whether scientific evidence sufficiently constitutes yediya b'lo reiya.

of Scientific Evidence in Halachic Courts

# The admissibility

The Gemara in Bava Basra 58a relays an episode in which an amora applies a primitive use of scientific evidence. A woman claimed that only one of her ten children was her husband's offspring, while the other nine were products of illicit relationships. When the man passed on, he declared in his will that only his real son shall inherit. Rav Buna was approached in order to help decide which of the ten was the biological offspring of this man and told each to spit on the father's grave. All of them complied except one. This individual was adamant that he would not desecrate his father's grave and would rather relinquish his inheritance than shame his father. Rav Buna concluded that this was the true son. To resolve this situation, the Gemara allowed the reliance on psychological scientific evidence alone.

#### **Telephones and Telegraphs:**

Proceeding chronologically with the advances in the field of scientific evidence, the Minchas Yitzchok 1:1 maintained that since telephones and telegraphs facilitate communication, that a husband has not communicated with his family can serve as evidence that this man is dead, and will thus relieve the wife of the aguna status. Rav Ovadya Yosef, as well, maintained that if a husband does not contact anyone, it is an umdenah demuchach, an extremely convincing conclusion, that he is dead and so the woman may remarry.<sup>1</sup>

#### **The Polygraph:**

The polygraph, or lie detector, allows one to determine when an individual is lying based upon changes in respiration, blood pressure, pulse rate, and responses in the skin. A major problem, however, is that the results may be misread by those not skilled in the procedure. Additionally, cunning individuals may be able to bypass the test by maintaining their bodily status constant. Rav Shlomo Korach permitted reliance on a polygraph, however it may not be the only source of

evidence. Rav Eliezer Waldenberg opposed a polygraph test, because it does not provide absolute proof and one can never ascertain the true thoughts of others. Rav Waldenberg based his opinion on a Gemara in Rosh Hashana 21b, which explains a posuk in Koheles 12 that states "Koheles sought to find acceptable words," meaning that Koheles wanted to judge cases in his heart without the testimony of witnesses. However a bas kol rebuked him and reiterated that two witnesses are necessary. Rav Waldenberg believed that since a bas kol did not allow Shlomo to judge without witnesses, a polygraph also would not be allowed. The Rabbinic Supreme Court of Appeals rejected the use of the polygraph as reliable evidence, because of the Torah's requirement of two witnesses.<sup>2</sup> On the other hand, Rav Moshe Feinstein in Igros Moshe, Even Haezer IV: 94, authorized a man who was physically unable to talk to give a get, through the intervention of a polygraph. The polygraph portrayed his positive response to the giving of the get and, thus, is halachically considered an umdenah, a probable conclusion that may be relied upon. However, Rav Moshe requested that the test be conducted a number of times in order to be certain that the results are conclusive. Also, he promoted the use of alternative tests if available, to prove definitively that this is what the man desired.

#### **Fingerprints:**

Rav Ovadya Yosef in Yabia Omer VI: Even Haezer no. 3, quoted the practice of Rav Dov Burstein, the av bais din of Tel Aviv, who allowed using fingerprints as the primary evidence in a case, without any other evidence necessary.

#### **Blood Typing:**

Blood testing as applied to paternity cases has become a very useful method of eliminating the possibility of a certain man being the father of a specific child. Based on the man's blood type and the child's type, in many instances one can

conclusively state that this man could never have produced a child with this specific blood type. For example, if the man's blood type is AB, the man can never father a child who has type O blood.

The Gemara in Nidda 31a teaches that each child is created through a partnership of three, its mother, father, and Hakadosh Baruch Hu. The Gemara explains that each partner contributes a certain part to the baby. The mother provides the red elements of the child. The Tzitz Eliezer, Rav Eliezer Waldenberg interpreted this to mean that the mother is the only one who contributes to the baby's blood and, thus, the use of a blood test in paternity cases would be illogical, because the father has no input regarding the child's blood. Rav Waldenberg was of the opinion that even though modern day science has established that the father, as well as the mother, influences the child's blood type, in future years this scientific fact may be proven false. Thus, according to the Tzitz Eliezer, a halachic court would not be permitted to rely on blood tests in a paternity case.<sup>1</sup> Rav Waldenberg's view of modern science is in disagreement with that of the Rambam. Although science is faulty at times, the Rambam was of the opinion that one must still accept scientific findings, even when they seem to contradict Chazal. Chazal did not base their scientific knowledge on religious belief, but rather they relied on the knowledge that was prevalent during their time. Rav Shlomo Zalman Auerbach maintained that if a scientific procedure is verified, implemented, and accepted universally then halachically it would be allowed as evidence. Furthermore, commenting on the analysis of the Gemara in Niddah, he explained that this statement of the Gemara was not to be understood literally and, in fact, may not even be referring to blood types.<sup>3</sup> Rav Chaim Regensberg, the Mishmeres HaChaim, has noted that blood typings



are biological facts, not merely suppositions and, thus, the results of blood tests would even override actual testimony, for such testimony would be viewed as false due to the definitive data obtained by the blood test.<sup>2</sup>

Rabbi Professor Dov Frimer, Hebrew University Professor of Law, differentiated between using the data obtained from blood tests to decide matters of inheritance versus deciding whether a child resulted by adultery. He explained that if the blood test concluded that the man is likely to be the father, but not to the extent of absolute certainty, this would be sufficient evidence with regard to the payment of child support, or for matters of inheritance. On the other hand, one may not determine mamzeros, illegitimacy based on blood tests. Even if the blood test definitively eliminated the possibility that the husband is the father, halachically this is insufficient evidence to prove that the

labeled a mamzer.<sup>3</sup> The Mishmeres HaChaim offered an additional proof why halacha does not allow, based on blood tests alone, to impose the status of mamzer. As long as the wife has not admitted to committing adultery with a Jew, the child could be a product of a relationship with a non-Jew and then would not be considered a mamzer. Rav Shlomo Aviner categorized blood tests as yediya b'lo reiya and explained that there is a machlokes as to whether this concept applies to mamzeros cases: Tosafos holding it is effective, while the Meiri disagreeing. Based on the previously cited reasons for not determining mamzeros based on blood tests, one should also refrain from investigating the case further in pursuit of other evidence that would prove this individual is a mamzer. Rav Mordechai Halperin recorded that originally the opinion of Rav Shlomo Zalman Auerbach was that since there are

### HLA Testing:

Human leukocyte antigens (HLA) are found on all body cells and each and every person has his/her own set of these genetically determined antigens. Surface HLA testing, an off shoot of blood type testing, has many advantages. Because this type of testing procedure can be done on all types of cells, not just blood cells, the Gemara in Nidda would not reject the test based on the fact that the mother solely contributes to the blood constituents of the child. Additionally, the test is at a minimum, ninety percent accurate, and not only can exclude a man who is definitely not the father, but can also prove that a man is almost certainly the father. However, the same halachic guidelines are applied to this test. It can be employed to decide whether a man must pay child support, but it cannot establish mamzeros due to the remote chance that the results are faulty. Justice Menachem Elon of the Israeli Supreme Court encouraged the use of HLA tests to provide evidence in paternity cases, but did not allow HLA test results to be introduced into a case that would lead an individual to being labeled a mamzer.<sup>3</sup>

### The Y Chromosome Genetic Marker of Kehuna:

The question of relying on the genetic marker on the Y chromosome as evidence of kehuna is addressed by Rabbi Alfred Cohen. A well designed genetic study concluded that most of the men who assume that they are kohanim, in fact, carry a unique genetic marker on their Y chromosome. Rabbi Cohen explained that, nevertheless, this information cannot be applied to remove any man from his status of kohen, as only seventy percent of all kohanim carry this marker and men of a small tribe in Africa also have this marker, suggesting that it is not exclusive to kohanim. Halachically, the genetic marker only

**Rav Shlomo Zalman Auerbach maintained that if a scientific procedure is verified, implemented, and accepted universally then halachically it would be allowed as evidence.**

wife committed adultery. A reason for this stringency is that the status of mamzer in halachic terms is not only a shameful title, but rather has very unfortunate ramifications. Halacha imposes the constraint on a mamzer in that a mamzer may only marry a mamzer. Blood tests, as is true with any scientific test, are not always completely accurate and are subject to errors, so halacha would rather disregard these uncertain results to prevent a person from being

doubts involved, one could only use the results of a blood test as supplementary evidence, but not as the primary evidence in the case. However, subsequently, Rav Auerbach wrote that if the test is well established, validated, and accepted throughout the world, then halachically one can rely on it.<sup>4</sup> In a criminal case, on the other hand, Dov Frimer maintained that blood tests would be enough evidence in order to acquit an alleged criminal.<sup>3</sup>



proves that the man's father was a kohen and thus he passed the marker on his Y chromosome to his son. It does not, however, prove that this man's mother fit the requirements to marry a kohen. Thus, the man may be a kohen genetically, because his father was a kohen, but he may not be a kosher kohen.<sup>1</sup>

### DNA Fingerprinting:

The most current type of scientific method of identification introduced into courts today is DNA evidence. Rabbi Cohen, contrasting DNA evidence to polygraphic evidence explained that the results of a lie detector are treated as an *umdenah*, a probable conclusion, while DNA evidence is an *umdenah demuchach*, an overwhelmingly convincing conclusion, because the chance of having a similar, but incorrect match is one in a hundred million. He therefore concluded that a lie detector would probably not be permitted, while DNA evidence may be permissible.

There are halachic guidelines for the identification of dead bodies. The *Shulchan Aruch Even Haezer 17:24* stated that even if a dead body is found possessing *simanim muvhakim*, distinguishing objects, these objects may have been lent to him by the true owner and thus do not identify the corpse. The Rama contended that, as opposed to distinguishing objects, a distinguishing body mark would be enough to identify the corpse. An example of a distinguishing body mark is a missing or extra finger. Concerning a specific case of a plane that crashed into the East River, Rav Moshe considered a ring with an individual's initials, a dentist's testimony about a gold tooth, and a belt, wallet, and papers that were found to declare the missing individual as dead. He thus allowed the woman to remarry, without acquiring the status of *aguna*.<sup>1</sup>

Unfortunately, much of what is recovered after bombings in Israel or after the fall of the Twin Towers, are just remains and scattered body parts, which must be

identified. DNA testing facilitates this process, because it can be performed on any body part. The accuracy of the test is nearly a hundred percent, however there is still room for human, as well as for technological, error. This slight chance, which affected halachic opinion regarding HLA testing, may also lead rabbis to forbid DNA testing in *mamzeros* cases. Rabbis Moshe Lazarus, Reuven Subar, and Avrohom Leftkowitz, rabbanim from Ohr Samaech, allowed one to rely on DNA evidence to conclude the death of an individual for burial. However, they did not allow a woman to remarry solely based on DNA evidence as in the case of an *aguna*, they required the testimony of witnesses. Rav Chaim Pinchas Scheinberg not only forbid DNA evidence as the sole proof in an *aguna* case, he also stated that it is halachically impermissible to rely on it alone in a case of inheritance.<sup>3</sup>

Rav Moshe Klein of Bnei Brak, as well as Rav Wozner and Rav Karelitz, hold that DNA evidence is not absolute enough for halachic courts. Therefore they do not allow DNA evidence to be used in *mamzeros* cases, in criminal cases, and in *aguna* cases, even if the match is exact.<sup>3</sup> Rav Wozner maintained that concerning criminal cases one can only convict based on the testimony of two witnesses. However, they allowed the use of DNA evidence to determine which limbs originated from the same body, allowing the body to be reassembled for burial. They emphasized that the sole purpose of DNA evidence in this case, is the association of body parts and not the identification of the corpse. These rabbanim also differentiated between a dead unmarried person and a deceased married person. Concerning one who was unmarried, DNA evidence is adequate proof to enable the family to start sitting *shiva*. However, with regard to a deceased married man, before sitting *shiva*, the family must first approach a *posek*, to ensure that the wife does not erroneously believe

that she is no longer an *aguna*.<sup>5</sup> In terms of inheritance, one can rely on this test only after it has been ascertained that there are no known heirs. If there are heirs, one cannot use the DNA evidence alone to remove money from established heirs and give it to another.<sup>6</sup>

The Israel Police Rabbinate permitted the use of three methods of corpse identification; fingerprints, dental records, and DNA. Concerning DNA evidence, they make no distinction between DNA taken from the missing person via antemortem samples and DNA extracted from parents or siblings of the missing person, as there is only one in a thousand chance of finding another match to the DNA sample. Rav Wozner, on the other hand, believed that DNA evidence that compares antemortem and postmortem samples of a missing person's DNA is "more than an intermediate identification mark and is close to a conclusive sign," *siman muvhak*. A test that compares DNA from the corpse to DNA of his parents or children is only a *siman beinoni*, intermediate sign. DNA evidence must never be the deciding evidence, there must also be other proofs of identification involved.<sup>7</sup>

Rav Wozner warned those who administer DNA tests, that they must be careful not to desecrate the dead body. Therefore, he suggested that these tests be performed on bodily fluids that are excreted, so as to bypass the problems of desecration. However, if there is no other possibility besides damaging the corpse, a competent halachic authority must be consulted as to the permissibility of conducting the test.<sup>6</sup>

Rabbi Mark Dratch, spiritual leader of Congregation Agudath Sholom in Stamford Connecticut, offered a more lenient approach and maintained that DNA evidence is as conclusive as fingerprints. Responding to opinions and arguments that contend that insufficient scientific studies have been conducted to definitively prove that no two people carry the



same DNA, except for identical twins, he stated that "Jewish law is not concerned with what would certainly be a miyuta d'miyuta, a statistically insignificant possibility." In criminal trials, halacha does not allow conviction without the testimony of two witnesses, even if there is very convincing evidence that the person is guilty. However, based upon a Rambam in Hilchos Sanhedrin 24:4-9, Rabbi Dratch expounded that there may be times when DNA evidence is sufficient in criminal cases. The Rambam taught that a halachic court can sentence punishments that are beyond those described in the Torah, as well as accept testimony that is usually halachically impermissible, for the well-being of society. Therefore, Rabbi Dratch concluded that since the goal of convicting a murderer is for the welfare of society, one may be allowed to use DNA evidence.<sup>8</sup>

A problem that arises when introducing any type of scientific test or evidence into halachic courts is that one must rely on the testimony of experts in those fields. How seriously does halacha view the reports of expert opinions. The Shevet HaLevi IV:83 is of the opinion that if yaish raglayim ladavar, there is a basis to the truth of the testimony, then the expert testimony may be believed. However, he was slightly resistant to allow the testimony of scientific experts alone, because if the results prove faulty, then the

expert can blame mistakes on the extent of scientific facts known at the time. However, when an expert may damage his reputation if he were to lie in testimony, then he may be believed, because he will surely present the truth for his own benefit. This rationale only holds true when the expert is employed by the court, however, if one of the dissenting parties employs the expert on its behalf, then the expert may not be believed, for he may certainly lie in order to persuade the court to favor his side. In this case, his testimony would not be an objective presentation of the scientific data, rather a slanted view of the facts, which may not be reliable. The Chasam Sofer stated that halachically, it is permissible to accept the objective truths of scientific knowledge, however, one is not allowed to give credence in Jewish courts to the expansion of the facts given by the experts. "The halacha accepts the truth of scientific or expert conclusions in a general sense, but it is not prepared to accept implicitly the word of a scientific expert as to the realities of the specific case before the judge."<sup>9</sup>

In the psak of Rav Klein of Bnei Brak, he stressed that scientific experts must display the evidence before a competent bais din, for it is the bais din that determines the final decision. Scientific expert testimony alone does not have the power in halacha to permit agunos to remarry or to declare someone a heir. Thus, all DNA evidence pertain-

ing to Jews must be submitted to a reliable bais din.<sup>5</sup> Rav Wozner concurred, and stated that all types of identification tests have to be performed in concert with a reliable bais din and not exclusively by scientific experts.<sup>6</sup> Dr. Jay Levinson, former chairman of INTERPOL Disaster Victim Identification Standing Committee, categorized expert testimony as yediya b'lo reiya and therefore concluded that it is permissible to introduce it into halachic courts and have the judge apply the knowledge of this evidence to the case. He stated that according to halacha, there is no qualification that a judge must be knowledgeable in all subject matters, rather, he must only be capable of interpreting the knowledge presented to him.<sup>9</sup>

As the field of biotechnology develops at an extraordinary pace, the scientific data that may be utilized in the court room, may become so conclusive, that there will be no question of admissibility. However, as the world embarks on its journey into the scientific frontier, halacha must always serve Jews as their guiding light. When issues arise in all aspects of knowledge, be it medicine, law, or business, rabbanim play an active role in applying Torah guidelines to these fields. The Torah is referred to as the tree of life, for it is a living document that encompasses all areas of study.

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## Notes

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**IN LECH LECHA (GENESIS 17:12) G-D COMMANDS ABRAHAM,**

"At the age of eight days old every male among you shall be circumcised throughout your generations." In his awe-inspiring dedication to G-d, Abraham had a circumcision (bris milah) immediately thereafter, despite his ripe old age of 99. Ever since that moment, it is a joyous occasion to hear the cry of an eight-day-old baby at his circumcision, because it ceremoniously indicates a lifelong dedication to Torah and mitzvos like his forefathers. In accordance with this theme, the Sefer Hachinuch states that the essence of this commandment is to make a physical differentiation between the Jewish nation and all of the other nations of the world, to parallel our innate spiritual differentiation.<sup>1</sup> Circumcision is the fundamental initiation into the Jewish nation, and as it states (Genesis 17:14), "One who does not have a circumcision will be cut off."

The severity of this commandment is evident, yet there is a particular instance when the circumcision must be delayed. According to the Shulchan Aruch, Yoreh Deah 263:1, when a newborn baby boy exhibits a yellow discoloration or signs of jaundice, then it is imperative that the bris milah be postponed. Rabbinic sages go out of their way to caution the performance of a circumcision in this case, because signs of jaundice were thought to represent a possible danger to life. . This extreme caution is due to the Jewish principle of, "ViChai Bahem," that one must live with the commandments in the Torah. If the fulfillment of a commandment endangers one's life, then one is exempt from its performance (unless, it is one of the three cardinal sins).

Who you callin' yellow?



Nowadays, there is an abundance of scientific and technological advancements that helps one to understand the clinical and halachik ramifications of jaundice.

Jaundice is a yellow discoloration of tissue and body fluids most commonly associated with newborn infants. The yellow discoloration, which results from excess bilirubin within the bloodstream, is indicative of one or both of two bodily malfunctions. Firstly, hemolytic jaundice occurs when there is excessive lysis or explosion of red blood cells.<sup>2</sup> This often occurs in newborn infants, because they have a greater number of red blood cells than normal adults and their red blood cells have shorter life spans.<sup>3</sup> Once the red blood cells burst open, they release hemoglobin, which in turn elevates the level of bilirubin in the bloodstream. When excessive amounts of bilirubin are released into the bloodstream, the liver cannot conjugate and subsequently excrete it sufficiently. As a result, the bilirubin populating the blood stream remains in the more toxic, unconjugated (unprocessed) form.<sup>2</sup> This is an extremely dangerous occurrence in infants because their "blood brain barrier," which normally prevents toxic substances from permeating the brain, is immobilized. As unconjugated bilirubin accumulates in the extremely sensitive brain tissues it results in the condition, kernicterus. The unconjugated bilirubin may cause severe damage to the particular section of the brain, known as basal ganglia, which controls the "fluidity of muscle movements." This horrific incidence is the primary cause of cerebral palsy.<sup>4</sup>

The second and more common type of jaundice, is hepatocellular jaundice, which results from the liver's inability to conjugate or excrete bilirubin.

This is also a common occurrence in newborn babies, because frequently their liver conjugation enzymes may not be functional for the first 7-14 days of life. In that case, even normal levels of bilirubin in the bloodstream are not sufficiently excreted, resulting in a yellow discoloration. This condition, called neonatal jaundice, is extremely temporary and it is alleviated once the liver conjugation enzymes develop.<sup>2</sup>

As hepatocellular jaundice has become more common in infants, some physicians now advise the parents that the performance of a circumcision will not endanger the infant, despite his yellow discoloration. Doctors frequently determine a bilirubin count, which is a clinical test that quantitates the amount of unconjugated bilirubin in the bloodstream. The normal value of bilirubin within the bloodstream ranges between 0.3 and 1.9 mg/dl. Jaundice is clinically diagnosed when the bilirubin count exceeds 2.5 mg/dl. By relying on the bilirubin count, some doctors are able to ascertain the infant healthy enough to be circumcised.<sup>5</sup> Due to the severity of the mitzvah of circumcision, there is a modern day halachik controversy as to whether it is indeed permissible to perform a circumcision on an eight-day-old baby who visibly exhibits the signs of neonatal jaundice.<sup>2</sup>

As noted previously, the Shulchan Aruch, Yoreh De'ah 263:1, stated that a circumcision should not be performed on a baby who has jaundice or yellow discoloration. This ruling is a stringency imposed to ensure the safety of the newborn infant. The threat of neonatal jaundice is seemingly nonexistent nowadays, so one might argue that "nishtaneh hatevah," that nature has changed since this halachik ruling was instituted. Despite

this line of reasoning, we consistently rule that when rabbinic sages dictated something as "dangerous," even if they seem to be discredited by modern science, their rulings are upheld. The Bach, Orah Hayyim 328:4, stressed that the physicians who encourage the circumcision of babies with jaundice are outright transgressing rabbinic law. The Pri Megadim, Eshel Avraham, Orah Hayyim 328:2 went one step further to claim that because this particular pathology is mentioned in the Talmud as being life-threatening, that in and of itself raises at least a significant doubt. Perhaps, the sages of previous generations had access to information that is unavailable nowadays, information that would expose the true hazards of circumcising a baby affected with jaundice. Accordingly, there is a halachik rule that even a situation with a one percent probability of danger is considered and treated as an extremely hazardous. Perhaps, the slim possibility of the baby's yellow discoloration being an indicator of severe liver failure or kernicterus, was what the sages considered enough of a health hazard to prohibit the circumcision of all babies who exhibited this condition.<sup>6</sup>

In the event that the doctor's advice is heeded and the infant has a circumcision despite his yellow discoloration, there are many consequences. For example, Rabbi Jacob Ettlinger, Teshuvot Binyan Zion, no. 87, stated that because this infant is being circumcised against Torah law, if, G-d forbid, he is circumcised on the Sabbath, it is then considered a desecration of Sabbath. In addition, the circumcision itself would not be considered valid, for it was not done at the appropriate time. Accordingly, if a child were to receive a bris milah prior to the disappearance of his yellow

low coloring, another symbolic circumcision would be necessary.<sup>6</sup>

The severity of the consequences with regard to this issue prompted many prominent rabbinical figures to issue a "Notice and Warning to Mohelim," on the 25th of Nissan, in 5737. This document defined the specific requirements that must be met with regard to this extremely difficult halackic ruling. The consensus reached within this document, was that a circumcision is forbidden if the infant has visible yellow discoloration or if his billirubin count is 5 or higher. In addition, any infant with a billirubin count of 10 or higher is considered seriously ill and therefore must wait

7 additional days after the illness has disappeared to be circumcised. There are still some disagreements as to the extent of the yellow discoloration. Rabbi Shalom Mordecai Schwadron, Da'at Torah, Yoreh De'ah 38:8 and Arukh ha Shulhan 263:3, ruled that the circumcision must be delayed even if the yellow discoloration is only present in the infants face. On the other hand, Rabbi Eliyahu Posek, Koret ha-Brit, Nahal ha Brit 263:1, disagreed and ruled that the circumcision should only be postponed if the yellow discoloration is present over the infant's entire body.<sup>6</sup>

The issue of circumcising an infant who has yellow discoloration is an

extremely difficult issue. The sensitivities that must be upheld with regard to this commandment merely emphasize the true depth and meaning of the commandment itself. Though all of the parties within this debate want to accurately fulfill this commandment, it is imperative that the voice of our rabbinic sages be heard. In the merit of maintaining our covenant with G-d by performing this Mitzvah correctly, may G-d maintain his covenant to the Jewish nation and bring Moshiach speedily and in our times.

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**AS TECHNOLOGICAL ADVANCES COME TO THE FORE AND MORE** discoveries are made regarding infectious diseases, today's society pulsates with innovative practices for maintaining proper hygiene and healthy bodies. Yet, health care practices are not modern interventions, but rather, have their roots in Jewish lore and scripture. The Jews were among the first to advocate hygienic practices and to scientifically develop preventive medicine. Their rituals had their basis in such medicine, for it is considered vital to the Jewish religion.<sup>1</sup> Among ancient cultures, health care was only practiced among the elite, while the Jewish people set health restrictions to all members of society, even to slaves.<sup>2</sup>

The book of Leviticus is rife with laws concerning health maintenance. Rigid orders are given that deal with avoiding sordid conditions, preventing contagious diseases, and ingesting healthy foods. Furthermore, in Deuteronomy, Moses, the prime lawgiver, established rules for military hygiene and nutritious eating habits.<sup>3</sup> Such commandments led Josephus, a Jewish historian who lived during the Roman occupation of Israel, to write about the importance of Mosaic rules for the isolation and purification of lepers.<sup>4</sup> Codifiers of the Talmud therefore stated that the Mosaic laws promote the physical, as well as the spiritual, welfare of the Jewish people. Apparently, the institution of social hygiene as a science has its origins in Biblical medicinal practices.

# Public health

in the Talmud

The earliest cases of organized health care are discussed in the Mishnah in Shekalim 5, 1, which states, "These were the officials who were in charge in the Temple"... "Ben Alijah for treating the intestinal diseases..." He had complete authority to purchase the medicines needed to treat his patients, the priests, who consumed excessive meat and water during the daily sacrifices and, thus, suffered from intestinal disorders. It is also said that Alijah knew which liquid remedies stimulated and decelerated metabolic activities. Moses Maimonides, in his Code of Laws, also stated that, "someone was appointed who cured them, he and those who were under his authority." Thus Maimonides suggested that there was not only one healer, but also a group of "specialists" assigned to the priests and who would be remunerated from the Temple's treasury.<sup>5</sup>

Later, in medieval times and the early modern period (17th and 18th centuries), Jewish communities did not function without establishing local sick funds. If a servant fell ill, it was the landlord's obligation to put him/ her in the hekdesh, or a hospice for the sick or for foreign people, for two weeks. It was the master's duty to pay for the servant's treatment and if the illness exceeded a month, compensation would come from the community treasury.<sup>6</sup> Thus, while Biblical laws espoused the individual maintenance of physical condition, preserving health and vigor was so important that institutions of organized health care were established to ensure the well being of every community member. Health considerations are of paramount importance in Jewish lore, and our sages understood that for an individual to live a healthy spiritual life, his spirituality must be housed in a healthy physical frame. Jewish law denounces any

mode of ascetic behavior and requires of its followers to serve G-d with both body and soul.

By delving into the biological and physiological functioning of the human being via surgical autopsies, the talmudical sages gained a keen understanding of the intricate workings of the human body, and so advocated the importance of ensuring all community members' equal health care. For example, autopsies performed on animals to determine their kashrut, led to tremendous pathological findings.<sup>7</sup> Although the extensive autopsies of animals during the talmudic times were purely religious in nature, and done solely to codify Jewish law, the talmudists nevertheless made extraordinary medical discoveries. The ritual killing of animals for food was the beginning of modern meat inspection, and the ritual of cleanliness eventually evolved to antiseptic surgery. Furthermore, the Jewish laws of cleanliness anticipated the scientific studies of microbial contamination by Pasteur and Lister.<sup>8</sup>

Through a process termed bedikah, all slaughtered animals were autopsied and meticulously examined to determine the condition of their internal organs. Rav, for example, spent eighteen months with shepherds and thereby studied eye diseases amongst animals.<sup>9</sup> The Mishna mentions one hundred and forty pathological conditions that affect the eyes. Fifteen of these can cause deformities in the head, spine, and extremities.<sup>10</sup> In another case, a lamb with weak hind legs was brought to Rabina to determine whether it was suitable for sacrifice. Rabina maintained that due to an injury in the spinal cord it was marred and unfit to be slaughtered. An autopsy confirmed Rabina's assertion and was the first recorded diagnosis verified by post-mortem examination.<sup>11</sup> Furthermore, Rav Ashi diagnosed the

atrophy of lung tissue by the presence of elastic threads.<sup>12</sup>

Based on their thorough examinations, the Rabbis were also able to assess the prognosis of a certain disease by studying the color, position, growths, cavities, and functions of the animals' internal organs. A black discoloration of the lung, for example, signified pulmonary deterioration. Talmudists further concluded that if a collapsed lung could still be inflated with air after immersion in water, then the animal's meat was still kosher, otherwise it would remain unfit to be slaughtered.<sup>13</sup>

Unlike Greco-Roman thinking, the talmudic Rabbis had a clear understanding of the physiology, and the morphological functioning of the human body. They stated, for example, that a cut in the trachea would not necessarily cause permanent harm and may be cured.<sup>14</sup> Acretaeus the Cappadocian, and Galen the Greek, postulated that any disease occurring in an animal's liver was fatal. In contrast, the Talmud explains that the infected part of the liver can be removed, thus sustaining the life the animal. Modern researchers confirmed their theories 1500 years later. A procedure performed in 1894 by Meister involved the removal of seven eighths of an animal's liver and it was still able to survive.<sup>15</sup> Thus, medical theories, which are rooted in ancient Jewish scripture, were in harmony with modern medicine.

Talmudists were highly accurate regarding the etiology and the origins of diseases. Infections resulted from changes in weather, ingesting excessive and mal-nutritious foods, work, trauma and stress, heredity, and uncleanliness.<sup>16</sup> Ancient Jews also understood that disease could be transmitted via food of contagious patients, travelers, utensils, clothing,



water, bodily secretions, soil, and air.<sup>17</sup> In his treatise on air pollution, Moses Maimonides promoted exposure to fresh air, which stimulated digestion, increased body resistance to infection, and strengthened the nervous system. He stated that, "One should at least choose for a residence a wide- open site...and ample sunshine. The air should be kept dry at all times by sweet scents, fumigation and drying agents. The concern for clean air is the foremost rule in preserving the health of one's body and soul."<sup>18</sup>

Although laws of cleanliness stemmed from concepts concerning theological and spiritual purification, as seen with the morning ritual for washing one's hands, many also originated from an awareness of personal hygiene and good health. Maintaining proper health precautions in Jewish society was so impor-

remainder back into the pot, and if one bit into a piece of bread, he should not offer it to another to eat, thereby avoiding bacterial spread.<sup>20</sup> Interestingly, diphtheria was so feared, that after the first case, the shofar was sounded to warn the community of its presence. Usually, the shofar is sounded after the third reported case of other diseases.<sup>21</sup>

With regards to cleansing, the sages in Sanhedrin stated that a public bath and lavatory must be set up in established cities.<sup>22</sup> They also dictated the purification of water, as noted, "It is forbidden to drink water that flowed through filthy places."<sup>23</sup> Tanneries, brick ovens, cemeteries, or animal slaughterhouses should not be within a radius of 50 cubits to a water supply.<sup>24</sup> Moreover, there should not be trees near a well, for fear that the roots may compromise the purity of the water. Carob trees,

Washing of the hands and feet in the time of the Talmud was also considered an important aspect in maintaining hygiene. It became an established custom to wash hands before and after every meal. During the anti-semitic rule of Hadrian, an episode occurred wherein a Jewish innkeeper cooked pork so as not to arouse suspicion that he was an observant Jew. He assumed that those individuals who stopped by for the night and did not wash their hands before eating were not Jewish, and thus served them pork accordingly. One Jew failed to wash his hands and was served the non- kosher meat. Upon discovering what he had ingested, the text reads that, "his hair stood up on his head and he was deranged and confused," for he was a Jew in secret. From this episode the Rabbis taught that, "by neglecting to wash hands before meals one was induced to eat pork."<sup>28</sup>

Washing ones hands was so imperative that even though bathing is forbidden on Jewish days of national mourning, because it invokes a sense of enjoyment, the Talmud states that a woman who is going to feed her child must wash her hands even on a fast day because of Shibbetha, a demon that personified filth and its detrimental effects.<sup>29</sup> Yet, while bathing was a key element in maintaining cleanliness, the Talmudists nevertheless warned that it should not be abused in a way that provokes indolence and lethargy, as it does to the aristocracy and nobility of surrounding cultures.

In conclusion, not only is today's society concerned with public health, personal fitness and hygiene, but a plethora of laws found throughout the Talmudic corpus deal with cleanliness and health as well. Our sages,

## **A**utopsies performed on animals to determine their kashrut, led to tremendous pathological findings. . . . Furthermore, the Jewish laws of cleanliness anticipated the scientific studies of microbial contamination by Pasteur and Lister.

tant that laws regarding cleanliness and sanitation are found throughout the Talmudic corpus. In fact, talmudists espoused heat or other antiseptic agents to disinfect clothing or utensils that have been infected with disease.<sup>19</sup> In Ketuboth the sages further warned people to maintain caution around flies that have been in contact with contagious patients or carcasses. When tasting soup, one was instructed not to pour the

which are known to have long roots, should be located twice as far away from municipal waters.<sup>25</sup> If water was suspected of contamination, it must be boiled before drinking.<sup>26</sup> Maintaining a water supply of limited contamination was so significant in Talmudic times that taxes were imposed on all inhabitants, including orphans and Rabbinic authorities, to secure a clean water source for drinking and irrigation purposes.<sup>27</sup>

however, did not express an avid interest in the workings of the human body solely for the sake of science. Their incredibly meticulous and calculated research serves as a medium to perform G-d's commandments in the best way possible. Autopsies were performed to determine the kashrut of an animal, and public health practices were established as law to ensure that every member of Israel serves God with a healthy body and soul.

Moreover, embedded within the notion of the Jewish health care system, is the principle of chesed- of reaching out to the plight of fellow Jews to relieve them of their ailments. The Judaic health care system does not discriminate. Everyone is treated equally, from society's aristocrat to its slave. Not only is the Jewish destiny to serve G-d with a pristine soul and a healthy frame, but at the Judaic core lies the notion of giving to others, for the mas-

ter to ensure the health of his servant, and for all Jews to live with a constant sensitivity towards those less fortunate. Thus, while the Judaic healthcare system is an infrastructure that provides physical aid, it is also crucial in determining the spiritual success of the Jewish individual in his community.

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**A RECENT CLINICAL STUDY NOTED REDUCED SPINAL BONE** mineral density in adolescents of an ultra-orthodox Jewish community in Brooklyn. One of the crucial determinants of bone mineral density is physical activity. As this particular community placed all their efforts into the learning of Torah, physical activity was not a part of their educational curriculum. As a result, their students, as compared to the norm, exhibited lower bone mineral densities and an elevated rate of bone fractures.<sup>1</sup>

Some orthodox Jewish communities consider physical exercise a waste of time and, therefore, a forbidden act. However, there is a significant distinction between exercising for health benefits and exercising for entertainment and pleasure, which may be considered bittul Torah. According to some rabbis, if a person exercises to improve one's health, this is not only encouraged but also is obligatory. The Rambam stated that, "Maintaining a strong and healthy body are prerequisites to serving G-d. After all, one who is ill cannot possibly devote his energy and focus to the study of his Creator."<sup>2</sup> To properly serve G-d with all your strength, a person must be physically fit. If done to enhance one's ability to maintain physical health and, thereby, to better perform mitzvot, then physical exercise is an essential ingredient in the service of G-d. The first two words of the Torah, beraishit bara, are translated, "In the beginning He created." Rabbi J. Rietti extrapolated this to read, "In the beginning comes health." Being healthy is the top priority on the list.<sup>3</sup> It is even obligatory to desecrate the Sabbath if there is a life-threatening matter regarding a person's health.

- a Purely Physical Act or a Part of Spiritual Life?

# Exercise:

Exercise is defined as the "physical exertion of the body that alerts one's respiration, forcing him to breathe deeply and more rapidly and successfully as before. Such movement is defined as exercise for that person."<sup>3</sup> Exercise improves physical work capacity, increases maximal cardiac output, enhances longevity, and decreases mortality.<sup>4</sup> Even simple exercise, such as walking, is beneficial to a person's internal organ systems (Shabbat 41a).

Improved health through physical exercising leads to a reduction in body weight, the prevention of some illnesses, such as heart disease and diabetes, and the improvement of a person's psychological, well being and mood and management of everyday challenges. Emotionally, exercising provides a release of energy and of repressed, aggressive instincts.<sup>4,5</sup> In terms of spirituality, a healthy body is a prerequisite for the fulfillment of many of the mitzvot. A person who is not healthy, will lack the proper concentration needed to learn Torah and will lack the energy needed to raise children in the way of G-d. Rabbi Y. Nissenbaum, one of the early leaders of religious Zionism, stated that in Diaspora, the Jews neglected their bodily health, which led to a spiritual and national weakness.<sup>6</sup> Apparently, he understood that a healthy body affects spiritual growth. Rabbi Y.L. Graubart, an early leader of the Mizrahi movement, declared that, "We must raise a strong generation, one which has solid muscles,

and adopt the rule of, 'a healthy soul in a healthy body.' Somehow a foolish belief has taken hold which avers that it is a mark of honor to be weak and feeble, as if this was synonymous with righteous and holy. Weakness is not a virtue. One whose body is weak is also weakened in spirit."<sup>6</sup>

Jews are taught to emulate G-d, Who is referred to as strong and mighty (Psalms 24.8). Many Jewish heroes, such as Joshua, Samson, Gideon, and David, were praised for their strength (Proverbs 20:29). "The Divine Presence rests only on a wise man, a strong man, a wealthy man and a tall man" (Shabbat 92a; Nedarim 33a). To emphasize the importance of exercise, Rav Karo ruled that young men who enjoy jumping and running on the Shabbat are allowed to do so (Orach Chayim 301:2).

Rav Avraham Yitzchak HaCohen Kook was a strong proponent of physical exercise. As cited by Ahrend,<sup>6</sup> Rav Kook wrote, "Our physical needs are great; we require a healthy body. We have become preoccupied with spirituality, we have forgotten the sanctity of the body. We have neglected the importance of health and the significance of the material. We have forgotten that our flesh is holy, no less than our souls." "Exercise, which the youth of Israel do in the Land of Israel, to strengthen their body in order to become brave sons of the nation, refines the spirit of the most righteous." As noted in the Talmud, (Shabbat 50b; Taanit 22b), a clean

and healthy body is a demonstration of respect to its true owner, our Creator." Some Rabbis believed that physical activity characterized Greek culture and not Judaism. However, Rav Kook disagreed and noted, "let the boys laugh and strengthen their muscles and their spirit for the nation. This holy work sends the Divine Spirit higher and higher, just as do the hymns of glory as recited by King David in the Book of Psalms."<sup>6</sup>

G-d gave us a physical body and that can be made holy. The Rambam stated, "Exercise is not just about being physically healthy so I have the energy to maximize my material pursuits."<sup>3</sup> All physical objects in this world have a higher purpose. Orthodox Jews understand that physical activities, such as eating and sleeping, can be elevated. If we eat or sleep excessively, these activities remain merely physical activities. Conversely, if we eat and sleep to regain energy to better serve our Creator, we have elevated mundane tasks to a high degree of spirituality. A similar rationale should be applied to exercising. Exercise, which at first glance may seem like a purely physical act, can be upgraded to a spiritual activity, as long as it is done for the sake of G-d.

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**ROSH HASHANA – LITERALLY “THE HEAD OF THE YEAR”** – celebrates the completion of the creation process and the birthday of mankind. After the shofar is blown on Rosh HaShana, the congregation recites, "Hayom Haras Olam" (today is birthday of the world), acknowledging the Jewish New Year. The Jewish year is calculated by adding the generations since the birth of Adom HaRishon (September 9, 3701 B.C.E.), this year equaling 5763 years. Yet, every biology textbook notes that the universe is approximately 15 billion years old and the Earth nearly 5 billion! How does Orthodox Jewry deal with this apparent discrepancy? Are we forced to admit that Torah and science exist on mutually exclusive planes? While some Torah scholars are unconcerned with the conflicts, many have proposed various approaches that describe a novel synthesis and convergence of the Torah and scientific viewpoints. Eliyohu (Tanna D'vay Eliyohu Rabba 31) informs us that HaShem consulted the Torah when He created the world. As the Torah served as a "blueprint" for creation and the subsequent development of the universe, it is impossible to discover any inconsistencies between the true nature of the world and the Torah.<sup>1</sup>

# It's about time



The various midrashic and talmudic references presented in this article propose a definite convergence of the Torah and scientific viewpoints regarding the "time conflict." However, before this issue can be discussed at length, some initial background information regarding the actual events of creation is needed. The scientific study of the origin, development, and other such large-scale phenomena concerning the universe is referred to as cosmology. Until the beginning of the 20th century, cosmologists speculated that the universe existed as a static realm. However, in 1929, Edwin Hubble discovered through astronomical observation, that light from distant galaxies is shifted towards red wavelengths (the more distant a light source, the greater its red shift) indicating that the galaxies seemed to be receding away from each other.<sup>2</sup> Apparently, as this observation implies, the universe is still expanding as though it had emanated from an infinitely dense and energetically compressed point 15 billion years ago.<sup>3</sup> This discovery paved the way towards the development of the Big Bang theory; a theory widely accepted by contemporary science as describing the physics of creation. According to this theory, all the material of the universe had once been pressed in an infinitely dense point. As compression generates heat, the initial matter-packed space of the universe was incomprehensibly hot and might have bubbled at trillions of degrees, before it detonated approximately 15 billion years ago.<sup>2</sup> While the contents of this "primordial atom" expanded into the frigid spaces and cooled into recognizable elements, space, time and matter were created.<sup>4</sup> Although the Big Bang does suggest a colossal explosion, it was not an "explosion" in the typical

sense of the word, rather it was a cosmic explosion of space itself. Before the Big Bang, nothing existed and, therefore, the Big Bang is the precise realization of Yesh Mei'ayin (absolute creation).<sup>5</sup>

Science has established that the universe is composed of matter (i.e., substances with well defined physical and chemical properties in the form of atoms and molecules), which constitutes everything within and around us. Einstein's theory of relativity,  $E = Mc^2$  (E denotes energy, M matter, and c the speed of light), elucidates how matter originated by illustrating that matter can be converted into energy and, more importantly, energy can be converted into matter. This provides the basis for the Big Bang theory, as although a huge amount of energy is required to produce a minute amount of matter, the energy present in the primeval fireball was significant enough to be the source of all matter in the entire universe.<sup>5</sup>

The Big Bang theory is predicated on the fact that the universe is filled with electromagnetic radiation dating back nearly 15 billion years to the very beginning of time. Although the primeval fireball was originally extremely hot and contained an enormous concentration of energy, with the passage of time the fireball cooled and expanded, resulting in the spread of weak, radiant energy. According to this theory, the energy of the fireball must still be thinly spread throughout the universe. However, when the Big Bang theory was first proposed, it was not possible to test for the presence of electromagnetic radiation and as a result, the Big Bang theory was not considered credible throughout the scientific community. In fact, the prominent British astronomer, Fred Hoyle, disliked the suggestion of a genesis-like

instant of creation and scornfully dubbed it the "Big Bang."<sup>2</sup> However, in 1965, two American radio astronomers, Arno Penzias and Robert Wilson of the Bell Telephone Research Laboratories, using an ultra-sensitive microwave receiving system to study radio emissions from the galaxies, detected a weak uniform radiation that seemed to be emanating from all directions in outer space. The only explanation for this radiation was that the universe was once superheated from a cosmic explosion of the "primordial atom." Following the discovery of cosmic microwave background radiation, the Big Bang theory became the accepted theory of cosmology.<sup>5</sup>

With the acceptance of the Big Bang theory, science has bridged an incredible gap with the Jewish perspective of creation, as scientists now admit that the universe had a beginning and, therefore, science coincides with the first word of the Torah (Bereishis).<sup>4</sup> Interestingly, the Big Bang theory closely parallels the Ramban's interpretation of Bria Ha'olam. The Ramban explains that before the universe was created nothing existed. HaShem created everything from absolute non-existence and brought forth energy and matter from total and absolute nothing, "nikuda k'tana daka v'ein boh mamash" (a very small point which was thin and had no substance). Ramban compares this minuscule speck to the size of a mustard seed, "nikud pachot m'gargir chardal" (Derashot HaRamban, 121), and describes it as being "devoid of corporeality but having a power of potency, fit to assume form and to proceed from potentiality into reality."<sup>6</sup> As science has shown that energy is the only intangible substance capable of being converted into matter, it appears that the



Ramban is describing Einstein's theory of relativity.<sup>4, 7</sup> Interestingly, some leading scientists have utilized similar language as the Ramban when referring to creation: Alan Guth of MIT explained: "From that cosmic mustard grain came not just the universe but a far larger structure whose galaxies may stretch incalculable distances."<sup>12</sup>

While there certainly may be a strong consensus among Torah scholars and scientists that the world did have a beginning, nevertheless, there is a disagreement as to how long ago the "beginning" occurred. In addition to cosmology, other scientific disciplines, including astronomy and geology, attest to the appearance of an ancient universe. In terms of astronomy, the stars actually appear in the form in which they existed many years ago, and in fact, some of these stars may not even exist today! Such currently "nonexistent" stars may have exploded into supernovae, collapsed into black holes, or simply burned out. As an example, the light emitted from the supernova 1987-A in the Large Magellan cloud, exploded 169,000 years ago, and has just recently reached the Earth.<sup>9</sup> This illustrates just how old the universe might be, as in order for the light of the stars to reach us, it had to be radiated many million or even billions of years ago.<sup>9</sup>

In addition, there are numerous dating methods that provide vast geological evidence for an ancient universe, and while the following methods may not prove that the world is billions of years old, it does establish that it is much older than 5763 years.<sup>9</sup> One dating method, known as dendrochronology, is utilized to calculate the age of a tree by analyzing the layers of wood in its trunk (i.e., annual tree rings). As an example, samples of the Bristlecone pine trees found in

the western United States contain tree rings indicating an age of approximately 9,000 years.<sup>9, 10</sup> Another useful dating method is the analysis of ice cores. It is possible to count the layers of ice formed annually in various ice cores throughout the globe. In Greenland, glaciologists have been able to distinguish 40,000 annual layers of ice.<sup>9</sup> Varve analysis, or the process of counting annual layers of sediment found in the deposits of glacial lakes, is another method used to date the Earth. While climatic and environmental pressures cause changes in the number of varves formed per year, the cyclic formation of distinct types of sediment is repeated uniformly. In the Green River formation of Wyoming, nearly 20 million thin varves were noted.<sup>9, 11</sup> Interestingly, many of the aforementioned dating techniques have also been confirmed with radioactive dating.

Radioactive dating with carbon 14 is utilized to measure the age of organic materials. All living things absorb carbon and utilize it to synthesize organic molecules. While the vast majority of these carbon atoms are carbon 12, a small fraction are of the radioactive isotope, carbon 14. Radioactive carbon forms when neutrons in cosmic radiation bombard the Earth from outer space and collide with atoms in the atmosphere. In particular, a neutron strikes and is absorbed by a nitrogen 14 nucleus, knocking out a proton and thereby yielding a carbon 14 atom. The continuous production of carbon 14 in the atmosphere balances the loss of carbon 14 by radioactive decay. As long as a plant or tree is alive, it continually uses the carbon from atmospheric carbon dioxide to synthesize organic matter (i.e., by photosynthesis). Furthermore, as animals eat

plants, they also receive a fresh supply of carbon. Since organisms cannot distinguish carbon 12 from carbon 14, and as both carbon types have supposedly maintained relatively constant atmospheric proportions, the ratio of the two isotopes within living organisms remains nearly constant. However, when an organism dies, carbon is no longer absorbed. Moreover, as carbon 14 has a half-life of 5730 years, the ratio of carbon 14 to carbon 12 decreases by half during this amount of time. Carbon dating is useful only for determining the age of organic materials less than 60,000 years old. Other radioactive isotopes with longer half-lives are used to obtain the age of inorganic matter and more ancient materials. For example, because its half-life is  $4.5 \times 10^9$  years, the decay of uranium 238 is useful in determining the ages of rocks on a geologic time scale. Radioactive dating methods using this isotope have shown that the age of the oldest Earth rocks are 4 billion years old.<sup>12</sup>

Radioisotope dating is dependent on two major assumptions, namely that the amount of radiation the Earth received in the past is identical to the amount received by the Earth today' and that the ratio of carbon 14 to carbon 12 has remained nearly constant.<sup>10</sup> However, cosmic radiation may have changed a number of times since creation. During the first three days of creation there was no sun. In addition, during the remainder of the seven days of creation the earth's atmosphere was denser, thereby decreasing the expected amount of radiation.<sup>1</sup> Furthermore, the Mabul (flood) during the time of Noach, was a period of immense and unimaginable global changes, including the possible separation of the continents, tilting of the Earth's axis, and massive



impacts by asteroids.<sup>13</sup> Changes in cosmic radiation due to fluctuations of the sun's intensity also occurred, as for example, during the time period of Yehoshua Ha'Navi, the earth stopped rotating, resulting in an increase of solar radiation in one hemisphere and a decrease in the other.<sup>1</sup> In summation, much of the familiar characteristics of geology and cosmology may have been formed much later than the actual six days of creation and, therefore carbon radioactive dating may not be accurate to reflect the initial moments of time.<sup>12</sup> Nevertheless, our experience with the laws of nature, including those that govern radioactivity, is that they remain relatively stable and are predictable.<sup>7</sup> Furthermore, radioactivity has passed the test of scrutiny both from the physical and chemical sciences. Finally, as mentioned previously,

Expanding on this statement, Rashi indicates that HaShem created the trees ready to bear fruit and Tosafos points out that all of HaShem's creations were created in their adult form with all the accompanying characteristics.<sup>9</sup> This idea leads to a theory known as the Omphalos argument, proposed by Phillip Henry Gosse in 1857. Accordingly, as HaShem created the entire universe and all of the organisms in a fully completed form, He likewise chose to create a universe with an established historic element.<sup>9</sup> For example, HaShem may have created trees with preexisting tree rings or may have purposefully placed the stars billions of years away from us. Furthermore, the radioactive dating scales may have been created to portray the existence of an ancient universe. While some rabbinic scholars claim HaShem may have

appearance of a universe older than 5763 years. His approach stems from the pasuk in Tehillim (105:8) "Remember forever His covenant, a word He commanded for a thousand generations," which seems to indicate that B'nei Yisrael was destined to receive the Torah after one thousand generations. However, as Moshe Rabbeinu was only the 26th generation after Adom, there must have been 974 generations before Adom. Is there any hint or reference in the Torah of these 974 generations? The Midrash (Bereishis Rabba 3:7) explores the possibility that the description of Brias Ha'olam in the Torah may actually indicate a progression of time preexisting creation. The first day of creation is described in the Torah, "It became evening and it became morning, one day (Bereishis 1:5)." However, if the concept of a calendar was first being created, it would not inherently make sense to declare, "It became evening..." rather it would be expected that HaShem would proclaim, "There shall be an evening, there shall be a morning, these will constitute one day."<sup>1</sup> It seems therefore, that the Torah illustrates the progression of time which predates creation. Is this possible? According to Rabbi Abohu, our present universe was not the first world created by HaShem, rather HaShem created many worlds and destroyed them successively. This is alluded to in the pasuk, "Behold, it is very good," (Bereishis 1:31) suggesting that this present world is very good, whereas the previous worlds apparently were not.<sup>1</sup>

The obvious question is why HaShem chose to create and destroy numerous worlds. In his sefer, Rabbi Brown<sup>1</sup> emphasizes

## **As the Torah served as a blueprint for creation. . . it is impossible to discover any inconsistencies between the true nature of the world and the Torah**

radiometric dates have been verified with the other dating techniques and the calculations are extremely precise.<sup>9</sup>

As it is impossible to ignore the vast scientific evidence for an ancient universe, it is necessary to delve into the various Torah approaches towards the apparent discrepancy. The Talmud mentions: "Everything in the work of creation was created in its full form (Rosh HaShanah 11a, Chullin 60a)."

presented a universe with a ready-made history to test our faith in the Torah, a Midrash (Tanna D'vay Eliyohu Rabba 3) contradicts this point stating, "There is no falsehood in the works of creation."<sup>14</sup> As it seems highly unlikely that all the scientific and historic evidence for an ancient universe are completely inaccurate, it is necessary to study other Torah approaches.

Rabbi Dovid Brown<sup>1</sup> presents an interesting explanation for the



that, "the whole universe with all its complexities, containing the knowledge of all the sciences, discovered, yet to be discovered, and perhaps never to be discovered, were all mapped out in His mind without flaw. What then was the problem?" According to the Talmud (P'sochim 68b), the world was created solely for the sake of the Torah and, therefore, the world's continued existence depended on the acceptance and continued study of Torah. Furthermore, as the Torah is predicated on the concept of bechira (free will), B'nei Yisrael had the choice to either accept or reject the Torah. This is evident from the fact that HaShem appeared to all the nations of the world and invited them to accept the Torah; only B'nei Yisrael chose to accept it (Sifray: Zos HaBracha, Devorim 33:2). Similarly, HaShem approached the "people" from all previous worlds and questioned as to whether they were willing to accept the Torah. Since they refused, their worlds' necessitated destruction, for the world was only created for the sake of the Torah. This process occurred 974 times, until, in the present world, the Torah was finally accepted; B'nei Yisrael exclaimed on Har Sinai, "All that HaShem spoke we will do and obey (Shemos 24:7)."

The Tiferes Yisrael (in his sefer *Drush Ohr HaChayim*) presents the possibility of prior universes and explains that the scientific evidence for an ancient universe such as the discovery of dinosaurs and other fossilized creatures poses no possible threat to the Torah approach as those creatures are not creatures from our own world, but rather are legacies of the 974 worlds that preexisted our own.<sup>15</sup>

Is it possible to bridge the concept of previous worlds with the exact 15

billion year figure proposed by scientists? Rav Aryeh Kaplan<sup>14</sup> presents various sources that lead to an astonishing result! According to the Talmud (Sanhedrin 97a), "the world will exist for 6,000 years, and in the 7,000th year it will be destroyed." The Sefer HaTemunah, an ancient kabalistic work, elaborates on this statement explaining that it refers to sabbatical cycles (shemitot). This 7,000-year cycle is merely one sabbatical cycle, however, as there are seven sabbatical cycles in a yovel (the Jubilee), the world is destined to exist for 49,000 years. (This kabalistic thought is based on the concepts of shemita and yovel, as described by the Torah, which consists of seven sabbatical (seven-year) cycles.)<sup>9</sup> The Ma'arechet Elokut (a classic kabalistic work) considers the 974 worlds to have existed during the Sabbatical cycles preexisting Adom's creation. Which cycle are we in today? There are differing opinions; some authorities maintain that we are currently in the second sabbatical cycle, while others claim we are currently in the seventh cycle. Focusing on the latter opinion, the implication is that the universe was 42,000 years old when Adom was created. This explanation has great significance as interpreted by Rabbi Yitzchok ben Shmuel of Acco (1250-1350). In his sefer, *Otzar Ha'Chaim*, Rav Yitzchok champions that as the sabbatical cycles appeared to have existed before Adom, it is necessary to measure their element in Divine years, and not in "Earth years." The concept of Divine years is noted in Tehillim (90:4) "One thousand years are in Your eyes like the previous day." According to this pasuk, a Divine day is equal to 1,000 years as viewed from human perception and a Divine year (365.25 days) is equal to 365,250 human

years. This leads to an incredible conclusion!! According to Rav Yitzchak, the universe would be 42,000 x 365,250 years old, which equals 15,340,500,000 years. As mentioned previously, scientific calculations based on cosmological evidence have proven that the Big Bang should have occurred approximately 15 billion years ago; this exact figure was mentioned in a sefer written during the 14th century.

Dr. Gerald Schroeder<sup>4, 7, 16</sup> arrives at the 15 billion year figure by means of a novel synthesis between the Torah and scientific viewpoints. As mentioned previously, the Jewish year is calculated by adding up all the generations since Adom HaRishon. However, it is noteworthy to mention a Midrash (Vayikra Rabba 29:1) which asserts that the Torah does not begin the calendar from the initial point of creation, but rather with the creation of Adom. Accordingly, the six days of creation are considered separate entities (not merely the six days before the first of Tishrei). This is evident from the phrase, "There is evening and morning;" time is not usually described in that way and therefore, time during that period must be considered as an abstract concept. Furthermore, there is a certain discontinuity in the numbering of the six days in the Torah. When the first day is mentioned, the Torah states, "There is evening and morning, day one." However, with the description of the second day, the Torah continues, "Evening and morning, a second day." The difference in phraseology leads the Ramban to conclude that "one" is absolute while "first" is comparative.<sup>4</sup>

The Ramban explains that on day one, time was created. Einstein's theory of relativity conveys that there was a creation, not just of space and mat-



ter, but also of time itself. Therefore, time has dimension and can be observed in different ways depending on where it is being viewed. For example, one minute on the moon proceeds quicker than a minute on Earth. In contrast, time on the sun is more "stretched out," and therefore, a clock on the sun would tick more slowly than on Earth. Variations in time perception directly coincide with variations of gravity and velocity.<sup>4</sup> According to Dr. Schroeder, "It so happens that there are literally billions of locations in the universe, where if you could put a clock at that location, it would tick so slowly, that from our perspective (if we could last that long) 15 billion years would go by...but the clock at that remote location would tick out six days. Nobody disputes this data."<sup>4</sup>

The Ramban notes that from the moment matter became tangible, time "grabbed hold." Incredibly, the Ramban's opinion coincides with the modern cosmological viewpoint, as cosmologists explain that the Big Bang brought time, space, and matter into existence by means of a hot, incredibly dense universe. However, as the initial temperature of the universe exceeded the threshold temperatures of particles, matter only existed in the form of photon energy. As space expanded, it began to cool, and quarks and anti-quarks (the most elementary type of sub-atomic particles) attempted to form from photons. Quarks, in turn, formed neutrinos and electrons, and eventually protons and neutrons (i.e., the final composition of matter) developed. After the universe expanded and cooled to the threshold temperature of "quark confinement," time "finally grabbed hold." The moment of time before the biblical clock begins lasted about 1/100,000 of a second. During that time, the uni-

verse expanded from a tiny speck and from the moment that tangible matter was formed, time began to flow. In reality, the oldest matter in our universe dates back to the moment of quark confinement and not to the moment when time was created.<sup>16</sup>

According to these concepts, our perceptions in terms of the time-space coordinates reveal a universe that is 15 billion years old. However, when the Torah states "day one," it is looking forward in time from the beginning moments. The Torah conveys that the universe was six days old by Adom's creation, because the Torah views time from vastly different time-space coordinates that exist today, as then the universe was much smaller. As space stretches and the universe doubles in size, time perception is cut in half. Therefore, 15 billion years and six days are the equivalents when viewed from the appropriate space-time coordinates. Amazingly, since scientists have been able to extrapolate the state of the universe during each moment of creation, they acknowledge that the events of each 24 hour period described in the Torah directly correspond to the events that occurred from our time-space coordinates. For example, the first day of creation lasted 24 hours, as viewed from the Torah's perspective; however, from our perspective this equals 8 billion years. As the universe doubled in size on each day of creation, the time period of each day from our perspective lasted half of the preceding day. When the respective figures of time from each of the six days of creation (from our perspective) are added together, the age of the universe is calculated at 15.75 billion years. Incredibly, this is the same figure calculated by modern cosmologists! Furthermore, it is possible to compare the day-to-day events of cre-

ation as described by the Torah with current theories of cosmology, paleontology, and archaeology; they correspond almost perfectly.<sup>4</sup>

In Sanhedrin (37a) it states, "Kol echad v'echad chayav lomar bishvili nivrah ha'olam," each and every individual must take to heart that the world was created especially for him. HaShem created the world in a way that was best suited for humans. He put man into a world with other creations made particularly to serve him, as man is the pinnacle of creation with the entire sixth day being devoted to his formation (Maharal in Chiddushei Agados and Tiferes Yisrael, Ch. 16). Interestingly, the idea of bishvili nivrah ha'olam, has recently been addressed by a group of respected scientists who claim that the very existence of living creatures is inherently linked to the laws of physics and cosmology and suggest that if even one of the constants of nature, such as the speed of light or the force of gravity, was slightly altered, the possibility of stars, planets or any type of life coming into existence would be deemed impossible. More importantly, this universe is so finely tuned, and the coincidences encompassing it so vast and improbable, that the nature of its existence cannot merely be considered a chance event.<sup>17, 18</sup> Professor Freeman J. Dyson of the Institute for Advanced Study in Princeton, captures the essence of the anthropic principle: "As we look out into the universe and identify the many peculiarities of physics and astronomy that have worked together for our benefit, it almost seems as if the universe must have known that we were coming."<sup>18</sup>

When a student in a first grade class of a yeshiva elementary school is taught the story of creation, he is simply exposed to the actual day-to-

day events of creation as literally described by the Torah (i.e., creation of light and dark, water and land, etc.). However, as the student matures, deeper insights and analysis regarding Bria Ha'olam are revealed to him. This will continue throughout his academic career and, in fact, even if he were to devote his entire lifetime to the study of creation, he still would not fully comprehend all the information that portion of Torah has to offer. As seen from the principle, "Shivim panim laTorah" (70 faces to the Torah), the words of Torah are

understood on many different levels, encourage interpretation and extend beyond literal explanations. Novel phenomena are revealed through constant Torah study, and while one opinion may override the view of another, the essence of Torah still extends beyond all the possible individual interpretations. Accordingly, there is no contradiction between the various Jewish viewpoints concerning the "time conflict," as each of the aforementioned approaches has validity on its own level. Furthermore, as there is no halachic or practical conse-

quence to the issue at hand, it is unnecessary to state a final solution.<sup>14</sup> As the Torah is infinite in nature, and as scientific theories are constantly changing, Torah scholars of different time periods proposed diversified explanations for the apparent discrepancy. It's about time we realize that with each generation, Torah and science are converging closer and closer, and that the Torah indeed serves as the "blueprint" for the world.

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**THE HALACHIC POSITION ON ORGAN DONATION IS EXTREMELY** complex since it stems from the Jewish standpoint on the sacredness of life and the role of our physical existence in the development of our spiritual selves. On the one hand, we have an obligation to preserve and safeguard human life, that is, the mitzvah of pikuah nefesh. This mitzvah is so important in Jewish law that nearly every other commandment may be broken for it. On the other hand, Jewish law prohibits desecration of a dead body, nivul hamet. A dead person's body, since it was created in the image of Hashem, is to be treated with the utmost respect and therefore many issues arise concerning organ donation. Most halachic authorities permit organ donation in the case when an organ is needed for a specific, immediate transplant. Additionally, many halachic authorities view it as a mitzvah for a Jew to donate organs to save another person's life.

Organ donation is not necessarily limited to the dead. In addition to cadaver transplants, doctors also utilize organs and tissues, such as kidneys and bone marrow, for transplantation from living donors. Problems exist concerning the halachic aspects of transplantation from living donors, including the danger to the donor, however small. Halacha prohibits one from intentionally wounding oneself, "A man should not place himself in a place of danger." (Shabbat 32b) Can one endanger one's own life in order to save that of another, pikuach nefesh? Donation under coercion is another concern. Halachic authorities agree that where a procedure is not life saving, one may neither significantly endanger the life of the donor, nor coerce the donor into donation.

# Kidney to spare?

From the verse, "You shall not stand idly by the blood of your neighbor" (Lev. 19:16), we learn that every Jew has a Torah obligation to save the life of one who is in danger. Anyone who is able to save a life, but fails to do so, violates this commandment. The Bet Yosef<sup>1</sup> brings concludes that one must even place oneself into a possibility of danger to save another's life. However, according to the Radbaz<sup>2</sup>, as mentioned by Rabbi Reuven Fink<sup>3</sup>, one is not obligated to lose a limb to save another person's life. Thus, the line is not clearly drawn when pertaining to tissues or organs, such as a kidney, where one can live a full life following donation and the level of health risk to save another is not defined.

Rabbi I. Jakobovitz, as mentioned by Dr. Fred Rosner<sup>4</sup>, states that a donor may endanger his own life to supply a spare organ to a recipient, whose life would thereby be saved, only if the probability of saving the recipient's life is substantially greater than the risk to the donor's life or health. A normal risk that one takes in everyday life is permitted, such as donating blood. Blood is routinely taken from healthy people and thus is considered acceptable to donate. Kidney transplantation from a living donor is more controversial as this is a routine procedure and there is much controversy regarding the long term affects of kidney loss for the donor, including the shortening of the life of the donor. If true, then such a donation may be prohibited since one is forbidden not only to end one's life, but to shorten it as well. According to Rav Waldenberg<sup>5</sup> of Shaarei Tzedek Hospital in Yerushalayim, if a high probability of shortening one's life exists, then kidney donation would be prohibited. Likewise, a living person is not permitted to make a donation at

all, if the donation is in itself life-threatening. If, however, there is a very low probability of negative health effects, then it would be permitted. To justify harm to oneself there must be sufficient assurance that the organ donation will indeed prolong the recipient's life. Even if a transplant donation is permitted, due to the high level of pain and discomfort associated with the procedure, it is not obligatory, but should one choose so, it is considered a mitzvah.

In general, according to halacha, one can assume that if the chance for survival of the beneficiary is greater than the jeopardy to the donor's life, then the procedure is acceptable. This principle is applicable to all transplants from living donors. Thus, kidney transplants from living donors may be acceptable, whereas liver-lobe donations might not be permissible. If in the future a procedure is perfected that is nearly pain-free and completely risk-free to the donor, then it is possible that there would then be an obligation to donate an organ.

Rabbi Reuven Fink<sup>3</sup> raises an intriguing problem in the name of Rav M. Meiselman<sup>6</sup>, inquiring as to the permissibility of the transplant recipient to undergo the surgery, as this encompasses the prohibition of "wounding" himself. Rav Mieselman then answers his question by stating that if the Kidney transplant will not enhance the patient's life expectancy more so than would dialysis, then he is prohibited from receiving the transplant, either from a cadaver or from a living donor. Should the kidney transplant extend his life expectancy, then it is acceptable for him to undergo the surgery to receive the transplant.

Our cells contain deoxyribonucleic acid (DNA), which is the genetic blueprint for our entire body's form and design. DNA also contains informa-

tion to determine the production of human leukocyte antigens (HLAs), which serve as "recognition" or "self" proteins. All cells in any particular body have the same DNA and therefore produce similar cell-surface HLAs. Unlike blood groups of which there are four types, A, B, AB, and O, there are many more different types of HLA proteins. As such, it is very rare to find a perfect tissue type match in the general population between a donor and a recipient.

Every person inherits two sets of DNA, one from his mother and the other from his father. Siblings might inherit identical sets of DNA from their parents (a one in four chance for each sibling). Alternatively, they may share half their HLA tissue type, which happens fifty percent of the time, or they may inherit completely different HLA proteins (again, a one in four chance). Consequently, a family member is more likely to be a good match to a sibling than to a random member of society. Furthermore, a kidney from a living donor succeeds in transplantation more often than from a cadaver and life expectancy is higher than that for patients on dialysis.<sup>7</sup>

Just as one has no right to refuse life-saving therapy, it is possible that one has no right to withhold vital tissue, if another's life is at stake. This could possibly allow for coercion in certain situations under halachic law. Assuming that a prospective donor was found, but remained unyielding to donate, is such a refusal warranted or is he obliged to donate the seemingly "extra" tissue or organ for a life saving transplant? Although logic may dictate that one is not required to render life saving assistance, the Torah seems to command otherwise. Sanhedrin 73a infers from numerous Torah sources the obligation to preserve the life of a fellow man.<sup>8</sup> Rabbi J.



David Bleich<sup>9</sup> reflects on this matter, citing the opinion of the Radbaz, mentioned previously, of the permissibility of sacrificing a limb to save another person. Such an action is not obligatory, but is deserving of commendation.

A person is obligated to sacrifice his entire wealth rather than transgress a negative commandment.<sup>9</sup> The commandment to preserve life is not only a positive commandment, but a negative one as well, not to stand idly by the blood of a fellow man. Are these two commandments so comparable to be bound by similar obligations? Rabbi J. David Bleich notes a major difference between material goods and limbs or organs. Limbs and organs cannot be replenished, whereas material resources are not permanently depleted. Thus, replenishable bodily

resources, such as blood and bone marrow, may be subject to the same set of rules as monetary wealth and their donation though coercion may be allowed under Torah law. Rabbi Mordechai Halperin<sup>10</sup> at first appears to disagree with this ruling, stating, "The coercion of potential blood donors might still be held to be prohibited even in lifesaving situations." Yet, he later states in the name of Rabbi Shlomo Zalman Auerbach, that one may pressure a potential donor when there is no health risk to the donor, reopening the door of coercion for blood and bone marrow. Apparently there is no clear ruling on the matter. Even if coercion of the donor for blood or bone marrow would be permitted, allowing for coercion in the case of kidney or liver-lobe transplants is much more difficult and

may be prohibited entirely, since these organs are not replenished by the body.

One may willingly expose himself to a low level of danger to preserve the life of another Jew. Since it may be difficult to determine what is an acceptable level of risk, one should also consult a rabbi before making a decision. An individual cannot force another to place his life in danger, even to save a life. In cases where there will be little chance of danger and no permanent harm, coercion of the donor may be allowed. However, one must consult an authoritative halachic figure before doing so as authorization is not entirely clear and may be prohibited in various cases.

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**IT IS OFTEN STATED THAT EDUCATION IN TORAH MUST BE A** continual, life-long process. A child that terminates his/her Torah education at an early age remains with that minimum knowledge, which further lessens, throughout later life. The depth of discussion of a topic in an elementary or high school is much different from a subsequent discussion of the same topic, but reexamined at a later stage of intellectual development. For a child who terminates his/her Torah education after elementary or high school, the topics discussed at these earlier ages may seem too simplistic when recalled later in life, especially when that same individual now has increased secular knowledge and sophistication without an accompanying increase in religious growth. The intent of this article is to review topics that may evoke "giggles" in an elementary or high school, but to demonstrate that with the appropriate scientific explanation such topics can be transformed from highly skeptical to very credible. This article discusses three topics: Dovid's body coldness that occurred in his seventieth year; the lactation experienced by a poor widower and by Mordecai; and the concept of shinuy hatevah.

# Strange, but true



### Case 1. Dovid's hypothermia

"And king David was old, he came into his old age, and they covered him with clothes, but he was not warmed" (I Kings 1:1). Dovid's physicians suggested that, as a solution to his body coldness, the young woman, Abishag the Shunemite, "shall be to him a warmer" (I Kings 1:2). Although the commentaries offered suggestions why clothes per se were not able to warm Dovid and why the physicians proposed this specific remedy, the following discussion will focus only on the biological aspects of this story. Three points will be addressed: (a) clinically, what was Dovid's diagnosis; (b) if chilled, why not simply provide Dovid with a warm quilt; and (c) if in fact he did require a human "warmer," why not select any of his eighteen wives.

Dovid, apparently, did not age well and his physical condition was extremely poor. He was seventy years old at this time; he ascended the throne at age thirty and reigned forty years. He lived a contentious life of victory and defeat, glory and ignominy, and had suffered grievous losses, including the death of his son, Absalom, and the wickedness of Amnon and Adoniah (Redak). Dovid's clinical diagnosis may have been hypothermia, defined as an internal (or, core) body temperature lower than 35°C, which is most common in the elderly. This diminished capacity to maintain body heat coupled with a greater vulnerability to core heat loss when exposed to the cold can, at times, can be more than a discomfort, it can be life threatening to the elderly.<sup>1,2</sup>

Thermoregulation, or the control of internal body temperature, is achieved through a number of involuntary, systemic measures, such as shivering, which generates heat, vasoconstriction

of peripheral blood vessels, which conserves internal heat, vasodilation of peripheral blood vessels, which releases heat, and sweating, which cools the body. These homeostatic mechanisms are under control of the central nervous system and tend to function less well, and less promptly, in the elderly.<sup>1</sup> Normal core body temperature is 37°C. Hypothermia, defined as a core body temperature lower than 35°C, causes global dysfunction, adversely affecting all body systems in proportion to the severity of the temperature reduction. The earliest symptoms, occurring at a core body temperature of 32 to 35°C, include unusual fatigue, increased weakness, some slurred speech, and minor confusion. The person's skin feels cold and the pulse is unduly slowed and irregular. At a core body temperature of 28 to 32°C there is an inappropriate reduction in shivering. Cardiac rate and output fall. Breathing becomes significantly slowed and the skin appears somewhat purple (cyanosis). If the core body temperature is lowered to 28°C, kidney function is altered and the body enzymes begin to malfunction, causing damage to organs, such as the pancreas. Terminally, the voluntary muscles become more rigid, the pupils of the eyes dilate, reflexes are diminished or abolished, and coma supervenes.<sup>3</sup>

Dovid's body temperature was not recorded (the clinical thermometer was developed in 1866).<sup>2</sup> Verse 1:1 of I Kings, however, clearly states that Dovid's clothes did not provide warmth. In discussing Dovid's loss of innate heat, Dr. E. Reichman<sup>4</sup> cites Rabbi David Kimchi: "In his old age, he became infirm and bedridden ... and as long as the aging process progressed, the innate heat continued to diminish." Apparently, Dovid's ability

to maintain body heat was so lowered that bedclothes were useless. The Ralbag notes that clothes per se do not provide heat but only serve to retain the innate heat radiated from the body. Thus, if the body were not generating sufficient heat, clothes or a bed quilt would serve little function.

Dovid's physicians suggested that a young woman, rather than any of Dovid's eighteen wives, serve as a warmer (Mezudat David on I Kings 1:14-15). Today, rewarming therapies for the hypothermic patient include the application of fluid-circulating heating blankets, convective air warmers, reflective blankets, heating pads, and radiant heat sources, all procedures that require modern technology. The methodology noted in Ta'nach apparently was suitable for that era. Body heat is derived from the various metabolic reactions, principally exothermic, catabolic reactions. For example, in the aerobic cellular respiration of glucose, only 39% of the energy in glucose is transferred to ATP; 61% of the energy in glucose is lost to the environment as heat.<sup>5</sup> The amount of body heat produced is a reflection of the energy in the total amount of food consumed. It is well known that in American society,<sup>6</sup> teenagers/young adults consume the most calories, and are among the most active. Thus, it is most reasonable that Dovid's physician suggested that the human "warmer" be a young adult, rather than an older woman. The commentaries specifically noted that a young woman, rather than one of Dovid's more mature, older wives, was required, as a younger woman releases more body heat (e.g., Rashi on I Kings 1:2).

From 1979 to 1998, 6,857 elderly Americans 65 years of age and older died of hypothermia.<sup>1</sup> The incident in I Kings occurred when Dovid was 70



years of age, during his last year of life. Rashi, on I Kings 1:1, hints that Dovid's hypothermia was the clinical cause of his death. Rashi quotes a Midrash: Rav Shmuel bar Nachmeni says, Dovid's body coldness was a result of the fear of dying, "As Dovid saw the angel of death standing in Jerusalem and his sword was in his hand, his (Dovid's) blood became cold from fear of him."

### **Case 2. The widower and Mordecai's lactation**

Male lactation is noted, at least, three times in traditional Jewish sources.<sup>7a</sup> In Sabbath 53b an event is noted in which a woman died, leaving her husband with an infant to be suckled. Being poor, the father was unable to hire a wet nurse. A miracle occurred and he was able to suckle the infant. Another event involves Mordecai and his orphaned niece, Esther. Esther's father died prior to her birth and her mother died at her birth (Megilla 13a). There are various viewpoints concerning the relationship between Mordecai and Esther. According to a Midrash, Mordecai adopted Esther as his daughter and subsequently nursed her (Bereshis Rabba 30:8). Lastly, 'milk of a male' is mentioned in Machshirin (6:7) and is considered as an unimportant liquid with regard to issues concerning tamei.

Male lactation is noted in the medical literature. It is a type of galactorrhea, which is defined as any amount of persistent discharge or material expressible from the breast, that appears like milk and that either does not occur in relation to parturition or continues postpartum in the absence of nursing for more than six months. In addition to male lactation, galactorrhea includes lactation in virgin females, menopausal females, and in the newborn of either sex ("witch's

milk"). Although many hormones interact to promote lactation, prolactin, a hormone produced by lactotrophs, cells of the anterior pituitary gland, is of prime importance. Excessive production of prolactin resulting from a tumor of the pituitary gland, a prolactinoma, is the most common cause of male lactation.<sup>8</sup> However, in the medical literature there is a case report of male lactation caused by exposure to excessive levels of estrogen.<sup>9</sup>

Did the poor widower and Mordecai have cancer of the pituitary gland, the most common cause of male lactation? Probably not, as their lactation was considered a miraculous occurrence, rather than an adverse side-effect of a carcinoma. If estrogen was the cause of lactation in the poor widower and Mordecai, what was the source of their exposure to estrogen, which is a female hormone? Interesting, in environmental toxicology a new chemical hazard has been identified, namely exposure to chemicals, both industrial and natural, that mimic the activity of estrogen. Xenoestrogens are synthetic, man-made environmental chemicals with estrogenic activity and include some chlorinated organics, such as DDT, polycyclic aromatic hydrocarbons (PAHs), triazene herbicides, and some pharmaceuticals. Exposure to such xenoestrogens during critical periods of human development has been postulated to play a role in the etiology of breast cancer in women<sup>10</sup> and in the deterioration of male reproductive health.<sup>11</sup> As most of these xenoestrogens were not synthesized during the eras of the poor widower or Mordecai, their exposures to estrogen-mimicking chemicals may have from a different source, possibly from plants. Environmental toxicologists are also concerned about overexpo-

sure to plant-derived phytoestrogens, which, as noted with the synthetic xenoestrogens, have estrogen-mimicking properties.<sup>12</sup> Perhaps, HaShem guided both the poor widower and Mordecai to consume plants containing elevated levels of phytoestrogens, thereby inducing galactorrhea.

### **Case 3. Shinuy HaTevah**

Peppered throughout the Talmud and in halachic literature are instances of shinuy hatevah, i.e., the changing of nature. For example, Sanhedrin (69b) notes that in prior generations a human female could give birth as young as six years of age and a human male of eight years of age could father a child. However, by Talmudic times, this was no longer possible as nature had changed. The Mishnah in Berchoros (19b) states that a cow can not produce its first offspring before the age of three years. However, by the time of the Tosafos, cows at younger ages were able to produce progeny (Avoda Zorah 24b). Rabbi Dovid Cohen<sup>13</sup> notes other examples of shinuy hatevah.

Shinuy hatevah is not a magical, overnight transformation of an individual organism, rather, it is the gradual transformation of a population. Probably, shinuy hatevah is what biologists refer to as environmentally induced adaptation. Adaptations are modifications that an organism makes in response to alterations in the specific physicochemical parameters of its environment; these adaptations occur through time. There is an intimate relationship and interaction between the biota and its abiotic environment. Alterations in the physicochemical characteristics of the environment have a direct impact on its indigenous biota, so that over time, the characteristics of the biota change to reflect the change in the environment. The Mogan Avraham



(Shulcan Aruch, Orach Chaim to 173:2) succinctly stated this concept: concerning shinuy hatevah, "everything goes according to the nature of the lands."

Shinuy hatevah may result from two distinct events: either a population is relocated to a new environment and thereafter changes to conform to the new environment or an environment changes and thereby induces its existing population to undergo changes. An example of the shinuy hatevah induced by relocation of a population to a new, different environment has been noted with Yemenite Jews. In a 1958-1959 survey of Yemenite Jews carried out shortly after their immigration to Israel, it was found that the prevalence of diabetes mellitus and the rate of mortality from coronary heart disease were extremely low in these immigrants.<sup>14</sup> However, when

after they changed their environment by immigrating to Israel, the prevalence of diabetes among them rose to that of Israelis who had originated from European and American communities."

An example of the environment changing and thereby affecting change in the resident population is seen in age at which females start to menstruate (i.e., age at menarche). In the United States, the menarchal age has been falling since the mid-nineteenth century, with an acceleration of approximately four months per decade between 1830 to 1960. This change is most likely related to socioeconomic factors, such as improved nutrition.<sup>17</sup> The suggestion that a critical body weight must be attained before menarche occurs<sup>18</sup> is consistent with the idea that improved nutrition played a critical role in lowering the age of menar-

chers to the dangers of childbirth. That women died at earlier ages than men was confirmed in archeological studies of the skeletal remains of the Jewish population in Israel from 100 B.C.E. to 600 C.E. The researchers concluded, "It will be noted that the average life span, as here suggested, was considerably lower among women than for men, very likely the result of high rates of maternal mortality, which in fact persisted world-wide until relatively recent times.<sup>20</sup> Thus, the reduction in female mortality during childbirth is not attributed to shinuy hatevah of women but rather to better healthcare and more extensive medical knowledge. Another aspect of technology affecting change is related to the viability of a baby born after eight months of gestation. Based on the Talmud (Shabbos 125a), the Shulcan Aruch (Orach Chaim 330:8) concludes that a babies born in the eighth month of pregnancy will not survive and, thus, it is forbidden to violate the Sabbath to try to save them. The Chazon Ish (Yoreh Da'eh, 155:4), however, states that today the nature of premature babies has changed (i.e., shinuy hatevah) and that all efforts should be made to save them. Rav Shlomo Auerbach (as cited by Rabbi D. Cohen<sup>13</sup>) also concludes that every effort should be made to save the life of an eight-month neonate, however, not because of shinuy hatevah, but because of the advances in modern medical technology in neonatal care. In other words, as explained by Rabbi Cohen,<sup>13</sup> Rav Auerbach's position is that the earlier rabbis drew conclusions based on the medical technology of their time.

A similar incidence of shinuy hatevah is evidenced in life expectancy.

## **For the child who terminates Torah education after elementary or high school, complex topics taught without depth during these earlier years will seem overly simplistic when recalled later in life.**

restudied twenty<sup>15</sup> and forty<sup>16</sup> years later, during which time the diet of Yemenite population changed and was now similar to that of western civilizations, their incidence of obesity, diabetes mellitus, hypertension, and ischemic heart disease increased and paralleled that of other ethnic groups in Israel. The researchers conclude, "Thus, it appears that in the specific ethnic group of Yemenite Jews, 40 years

che.<sup>19</sup> Rabbi D. Cohen<sup>13</sup> has reviewed the concept of shinuy hatevah as applied to the female and male reproductive system.

In addition, there is a "perceived," but not actual, shinuy hatevah that is related to advances in technology rather than to changes in a population. For example, in discussing the concept that "death is a common occurrence" in women (Kesubos 83b), the Tosafos relate that this

As noted in the Shulcan Aruch (Yoreh Da'eh, 244:1), it is a mitzvah to stand when an elderly individual, even one not versed in Torah, enters into your presence. Elderly is defined as an individual of 70 years and above. In the United States, the average life expectancy is greater than 70 years and rising. Because of the decline in smoking, death rates from heart disease, stroke, and cerebrovascular diseases have been reduced, and because of safer cars and more people wearing seat belts, death rates from motor vehicle crashes also have declined. Whereas, the average American baby born in 1900 could expect to live 47.3 years, today life expectancy has reached 76.9 years.<sup>21</sup>

This article began with the thought that some topics may evoke "giggles" in class. For example, when I noted Mordecai's lactation in a college class, several students laughed and then gave strange looks. However, there is a scientific basis for this, rather unusual, phenomenon. It should be noted that Rohn<sup>8</sup> in his article on male lactation, published in the prestigious medical journal, the Journal of Adolescent Health Care, was not ashamed (and, apparently, not worried about giggling colleagues) to begin the article as follows: "Inappropriate lactation – which occurs beyond the usual postpartum or breast-feeding period or in the male – has been of medical interest for centuries. There is a suggestion

that the first recorded case occurred in the Bible in the Book of Esther wherein Mordecai may have breast his niece Esther. The Talmud describes a man who nursed his infant after his wife's death during childbirth."

*P.S. In my younger days I was also one of those who giggled at these stories. However, I now understand that some of the, albeit strange, events noted in the Talmud are true! The limiting factor in understanding these events was my knowledge.*

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## Notes

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