

SURVEY OF RECENT HALAKHIC LITERATURE

AUTONOMOUS AUTOMOBILES AND THE TROLLEY PROBLEM

Autonomous vehicles employ advanced sensor technology to detect surroundings and sophisticated algorithms to predict the trajectory of nearby moving objects. Self-driving cars can also use information technology to communicate with each other, thereby achieving better coordination among various vehicles on the road. However, since automobiles are heavy and move at high speeds they have limited maneuverability and often cannot stop before traversing a significant distance. Therefore, even if automobile-to-automobile communication, sensors and algorithms are all functioning properly, autonomous automobiles will not always have sufficient time before collision with objects that suddenly change direction. It is inevitable that self-driving automobiles will sometimes collide with each other, with human-driven automobiles, and with pedestrians.

Automated vehicles must perforce be programmed to respond to situations in which a collision is unavoidable. They must be programmed to select one option out of two or more possibilities.

Consider the following example. An autonomous automobile carrying five passengers approaches a heavy truck that suddenly departs from its lane and heads directly towards the autonomous automobile. In a split second, the self-driving car senses the trajectory and the weight of the oncoming truck. It calculates that a high-impact collision is inevitable with the resulting death of five passengers. Those deaths can be averted only if the car swerves towards the pavement on its right-hand side. Unfortunately, an elderly pedestrian happens to be crossing the road and will be killed if the autonomous automobile swerves to the right. In order for the five passengers in the self-driving car to be preserved from death, the car must swerve in a manner that will kill a single person.¹

¹ This example is taken from Sven Nyholm and Jilles Smids, "The Ethics of Accident-Algorithms for Self-Driving Cars: An Applied Trolley Problem?" *Ethical Theory and Moral Practice*, vol. 19, no.5 (November 2016), p. 1278.

On first analysis, the issue seems to be identical to a problem addressed by *Hazon Ish: Hoshen Mishpat, Sanhedrin*, no. 25, s.v. *ve-yesh le-ayyein*, involving a flying arrow (or grenade) whose trajectory will cause it to land in the midst of a large group of people. A bystander has the ability to deflect the arrow so that it will fall elsewhere and kill only a single individual. Is he permitted to do so in order to limit loss of human life?

The Palestinian Talmud, *Terumot* 8:4, discusses the case of a group of people ordered to deliver a single person from among their number to be put to death and are admonished that, should they fail to comply, the entire group will be killed. The Palestinian Talmud forbids them to become complicit in the death of even a single person despite the fact that, as a result, the entire group will be annihilated. Deflecting an arrow or a hand grenade would seem to be analogous to the situation addressed by the Palestinian Talmud.

Nevertheless, *Hazon Ish* distinguishes the case under discussion from the situation addressed by the Palestinian Talmud with the comment that delivering a person to death is an act of cruelty while rescue of the larger group is merely an attendant circumstance. Deflecting the arrow, however, is primarily an act of rescue unrelated to the death of the single person who happens to be in the path of the arrow. Nevertheless, *Hazon Ish* expresses reservation with regard to the validity of that conclusion on the grounds that death of the single victim of the diverted arrow or grenade is not caused indirectly by delivering the victim to murderers but is the direct result of the act of deflecting the arrow. An act constituting the proximate cause of the death of an innocent victim, suggests *Hazon Ish*, is forbidden even in order to save a much larger number of lives.

The basic principle enunciated by *Hazon Ish* in distinguishing an act of murder from an act of rescue is unexceptionable. To be sure, rescue of the many has priority over rescue of an individual. Triage in the emergency room requires that, when time is of the essence, tourniquets be applied to multiple accident victims before a longer period of time is devoted to a single patient who requires extensive life-saving treatment.

The foregoing notwithstanding, there are circumstances in which it is difficult to distinguish between rescue and complicity in murder. During the Holocaust the Nazis quite frequently sought the assistance of members of the *Judenrat* in accomplishing their diabolical goals. In many cities, including Vilna, they demanded lists of various categories of Jews to be deported to death camps. Failure to cooperate was punishable by death. Fully aware of the consequences, the local rabbinic authorities forbade the ghetto leaders to comply. In Kovna, a city not far from Vilna, the Nazis also demanded cooperation but in a different guise. They approached the

Judenrat and presented several thousand white cards to them with instructions to distribute the cards to able-bodied workers. All other residents faced imminent deportation. With great emotional anguish, the rabbinic authorities of Kovna, including the eminent R. Avraham Dov Ber Kahana-Shapiro, counseled cooperation.²

At least one Holocaust historian found the halakhic advice contradictory and assumed that conflicting advice given in those two cities reflected opposing halakhic views.³ That was not the case. The fact pattern in Vilna was identical to that addressed by the Palestinian Talmud, *viz.*, "Deliver one of your company; if not, we will kill all of you" and the rabbinic authorities responded accordingly. In Vilna the Jewish officials were ordered to prepare lists of individuals to be consigned to death. In doing so they would have become complicit in homicide. Whether consciously as part of their malevolent scheme or otherwise, the Nazis presented the *Judenrat* with an opportunity to save at least a limited number of lives. They did not solicit assistance in designating people for death. Instead, they presented conditions for sparing the lives of some individuals already marked for death. Receipt of a white card represented a reprieve from what would otherwise have been certain death. A consequentialist would object that the net result was the same. Nevertheless, the essential nature of each of those acts was different: one constituted the taking of human life; the other, limitation of atrocity.⁴

However, the situation described by *Hazon Ish* is entirely different from conventional acts of rescue that may leave others to die. The emergency room physician has done nothing to cause the death of the patient he does not treat. In distributing cards to some inhabitants of the ghetto the *Judenrat* preserved the lives of those who were within their power to rescue. They did not decree death for those they could not save nor were they even indirectly complicit in delivering the victims to the oppressor. In contradistinction, the goal of the person who alters the course of the arrow and causes it to strike a previously unendangered victim is indeed to preserve the lives of a larger number of people but, his intention notwithstanding, it is the act of the intervenor that is the proximate cause of the death of a previously unendangered innocent victim. The intervenor's

² See Leib Garfunkel, *Kovna ha-Yehudit be-Hurbanah* (Jerusalem, 1959), p. 72

³ Bernhard H. Rosenberg, *The Holocaust and Halakhah* (New York, 1976), p. 160, note 13.

⁴ See J. David Bleich, *Be-Netivot ha-Halakhah*, I (New York, 5756), 118-126. Cf., R. Ephraim Oshri, *Teshuvot Mi-Ma'amakim*, vol. V (New York, 5739), no. 1 and Esther Farbstein, *Be-Seter Re'am* (Jerusalem, 5762), pp. 171-175.

motive is the rescue of unendangered victims but his act directly causes a death that would otherwise not occur.⁵

This dilemma is virtually identical to what has become known as the Trolley Problem. In the Trolley Problem, a driverless trolley is headed towards five people who are stuck on the track and who will be killed unless the trolley is redirected to a side track. An engineer is standing next to a switch. If he pulls the switch the trolley will be redirected to a side track and the five presently standing in the path of the trolley will be rescued. However, standing on the side track there is another person who will be killed if the switch is pulled to redirect the train. Is it morally permissible to preserve the lives of five individuals by redirecting the train and thereby killing a single person who was heretofore not at all in danger?⁶

A variation of the problem is presented in the Footbridge Hypothetical. In the latter case, a pedestrian is standing on a footbridge that traverses the track. Also present on the footbridge is an extremely large and heavy man. His body mass is substantial enough to stop the trolley if he were pushed off the footbridge and onto the track. However, if he is pushed off the footbridge into the path of the trolley he will certainly be

⁵ See R. Benjamin Rabinowitz-Teumim, *No'am*, VII (5716), 357 and R. Eliezer Waldenberg, *Ziz Eli'ezer*, XV, no. 70. Cf., *Hazon Ish's* analysis of the controversy, *Hazon Ish: Hosben Mishpat, Bava Mezi'a* 62a, between R. Akiva and Ben Petura, regarding allocation of a container of water sufficient to save one wayfarer traversing a desert from death as a result of dehydration but not two. According to *Hazon Ish*, the quandary is whether to save one person by giving him sufficient water to enable him to reach civilization or to divide the water and thereby merely prolong the life of each traveler for a relatively brief period of time. Both agree that, in principle, the water should be divided equally. However, Rabbi Akiva maintains that, since the water belongs to one of the two, his own life is to be given priority. Both would agree that a third party may not save one at the expense of foreshortening the life of the second despite the fact that the third party is engaged in an act of rescue and is in no way complicit in the death of either.

⁶ The trolley problem was first proposed as a moral dilemma by Professor Philippa Foot, late of Oxford University, and revisited by her in various iterations during the course of a long career. See Philippa Foot, "The Problem of Abortion and the Doctrine of Double Effect," *Oxford Review*, No. 5 (1967), pp. 5-15., reprinted in *idem*, *Virtues and Vices And Other Essays In Moral Philosophy*, 2nd ed. (Oxford, 2002), pp. 19-32. See also Judith J. Thomson, "Killing, Letting Die, and the Trolley Problem," *The Monist*, vol. 59, no. 2 (April, 1976), pp. 209-217 and *idem*, "Turning the Trolley," *Philosophy & Public Affairs*, vol. 36, no. 4 (Fall, 2008), pp. 359-374. For a review of the literature discussing this problem see S. Bruers and J. Braeckman, "A Review and Systematization of the Trolley Problem," *Philosophia*, vol. 42, no. 2 (June, 2014), pp. 251-269.

killed. Is it morally permissible to push this person to his death, thereby saving five other persons standing in the path of the trolley?⁷

The same dilemma might well arise in the operation of a conventional motor vehicle: a driver suddenly sees two pedestrians crossing a road in front of him. Given the velocity of the car, if he does nothing, both victims will be struck and killed. If he swerves one way or the other, he will avert one of the pedestrians but not both.

The halakhic ramifications of both the Trolley Problem and the Footbridge Hypothetical presented in the case of the autonomous automobile must be examined in light of the discussion of an entirely different matter presented in *Shabbat* 4a. During the talmudic period, the commonly employed bread-baking process called for firmly pressing loaves of bread against the oven wall. The Sages prohibited detaching baked bread from the wall of an oven on *Shabbat*. Baking is one of the thirty-nine proscribed forms of labor. For purposes of culpability, violation of the Sabbath prohibition is defined as placing bread in an oven and allowing it to remain *in situ* until browning of the surface occurs or until the loaf becomes somewhat hardened, i.e., the bread cannot be broken without causing strands of partially baked dough to become elongated. The question posed by the Gemara is as follows: Suppose a person knowingly and willingly placed bread in the oven on *Shabbat*. Later, thinking better of his misdeed, may he remove the bread from the wall of the oven before it becomes “baked” as defined by Halakhah? Detaching the bread from the wall of the oven is the only way to avoid culpability for baking on *Shabbat*. Yet, removing the loaves of bread constitutes violation of a rabbinic edict. The question is, did the Sages forbid that act even when its performance is necessary to avoid the ripening of a biblically forbidden act into a capital offense or was an act performed under such circumstances excluded from the rabbinic prohibition?

The question, as posed, presumes an antecedent premise postulating that a person who performs an act that, unless reversed or curtailed, will result in a culpable offense, is *ceteris paribus*, required to curtail the culpable effect of the act by any means within his power. Thus, for example, if a person places a pot filled with water over a fire on the Sabbath, so long as the water has not reached “cooking” temperature it is incumbent upon him to remove the pot. It is self-evident that if a person has placed

⁷ See D. Edwards, *Would You Kill the Fat Man? The Trolley Problem and What Your Answer Tells Us About Right and Wrong* (Princeton, New Jersey, 2014) and T. Cathcort, *The Trolley Problem, or Would You Throw the Fat Guy off the Bridge?* (New York, 2013).

multiple pots over a fire but cannot manage to remove all of them in a timely manner, he must nevertheless remove as many as physically possible in order to minimize the number of culpable transgressions.

Application of that principle to the present discussion yields a novel point. It is manifestly forbidden for an individual to cause the death of one person in order to preserve the life of another, since, paraphrasing *Pesahim* 25b, “Why do you think that the blood of one is redder than the blood of his fellow?” Similarly, it is forbidden to kill one individual in order to save the many since there are no grounds for assuming that even the blood of many is redder than the blood of a single individual. In effect, Halakhah regards all lives as endowed with infinite value and asserts that in a system of moral values, if not in mathematics,⁸ all infinities are equal.

Consequently, a bystander who has committed no illicit act but seeks to perform an act of rescue by diverting an arrow dare not cause the death of an unendangered individual in order to spare the many. However, the archer who has already unleashed an arrow is confronted by a significantly different equation. In releasing the arrow he has performed an act that will result in multiple crimes of homicide. Even though he has released but a single arrow he will be culpable for the death of each and every victim. If it is possible for the archer to deflect the arrow he is halakhically bound to do so, not simply because he is obligated to rescue any and all victims no less so than an otherwise uninvolved bystander, but also because each homicide is a separate culpable offense. Quite apart from any obligation of rescue, the archer is obligated to thwart his own act in order to counteract the act of potential homicide that he has performed before it becomes actualized in the death of a victim. For him, deflecting the arrow from the many and allowing it to strike only a single victim reduces his culpability for multiple instances of homicide to responsibility for only a single act of homicide. From the vantage point of the person who has shot the arrow the situation is analogous to that of a person who, on *Shabbat*, has placed several pots of water on a stove but cannot manage to remove all of them before the contents of each pot rises to the level of a biblically proscribed act of “cooking.” With regard to the pots that he has placed on the flames, such an individual is clearly obligated to remove as many pots as he can in order to ameliorate the severity of his infraction. Rescue is not part of that equation; similarly, the principle of rescue is not germane in determining the responsibility of the archer.

⁸ For a popular exposition see Eli Maor, *To Infinity and Beyond: A Cultural History of the Infinite* (Boston, 1987), pp. 2-60.

Nevertheless, it is not at all clear that a person may choose the death of one person over the death of many others simply in order to vitiate his own acts of homicide. Just as a person dare not kill in order to save his own life, he may not be entitled to a choice of whom to kill in order to spare himself from multiple homicide transgressions. Nor is it at all clear that a person may utilize a similar expedient in order to minimize other transgressions. Such a situation is comparable to that of a person who has placed a number of pots filled with water on a stove on *Shabbat* but, because of their weight or of some other factor, is incapable of removing them from the stove other than by taking another filled pot standing on the side, whose contents will not become cooked unless he intervenes, and employs that pot to push several other pots off the stove in order to prevent their contents from reaching the temperature specified by Halakhah as that at which cooking occurs. It is not clear that a person may initiate a new transgression in order to prevent the ripening of a previously completed act into multiple transgressions. Confronted by such a situation, the motive for placing a new pot over the flame may be salutary but the new act represents commission of a willful transgression—albeit in the nature of an *aveirah le-shemah*, a “sin for a holy purpose.” It is far from clear that such a transgression can be sanctioned. In all likelihood, such an act is forbidden.⁹ If so, it follows that a person dare not initiate a new act of homicide in order to avoid culpability for a homicide – or multiple homicides – that would otherwise occur as the result of a previously completed act.¹⁰

In addition, a person finding himself in such a quandary who desires to mitigate his transgression by actively causing the loss of only a single life rather than the death of many would not be culpable for the deaths he is ordered by Halakhah not to avert. *Tosafot*, *ibid.*, s.v. *kodem she-yavo*, raise an intriguing point. The question posed by the Gemara is whether the rabbinic prohibition regarding removing loaves of bread from an oven wall on *Shabbat* extends even to a situation in which that act is designed to avert a biblical transgression. Assuming, *arguendo*, query *Tosafot*, that the Sages actually did prohibit removing bread from the oven wall even in such circumstances, who would obey them? The conflicted person is

⁹ It is doubtful that the consideration “Transgress a single Sabbath on his behalf so that he may observe many Sabbaths” (*Yoma* 85b) applies to avoidance of multiple acts on a single Sabbath. Moreover, that principle is presumably limited to “Sabbath violations.”

¹⁰ Cf., *Sefer Hasidim*, ed. Jehuda Westineiski and J. Freimann, 2nd ed. (Berlin, 5674), no. 1460 and R. Moshe Leib Shachor, *Avnei Shoham*, 2nd ed. (Jerusalem, 5774), vol. I, Leviticus 19:30-31, p. 272.

confronted with a dilemma greater even than a Hobson's choice. There is no way that he can totally escape transgression. Given the choice between a capital transgression and violation of a rabbinic prohibition, the motive of a person who chooses to disobey a rabbinic decree can hardly be faulted. Of course, the thrust of *Tosafot's* objection is not the authority of the Sages to promulgate such decrees but that it would have been purposeless for the Sages to have encompassed such a contingency in their edict if the better course of wisdom would decree that it be violated in such circumstances.

It is *Tosafot's* resolution of that perplexity that is striking. *Tosafot* declare that, assuming the rabbinic decree actually applies in such a situation, prudence would not be a factor because a person who obeys the edict and allows the bread to remain in place would incur no penalty. Being prevented from retroactively curing his transgression by reason of present obedience to a rabbinic injunction constitutes an *ones* or *force majeure*. Therein *Tosafot* propound a novel thesis: Not only is *force majeure* a principle that serves to disassociate any act from its perpetrator and effectively remove him as the author of the act but, even if the act itself is knowingly performed so long as its effect has not yet been actualized, if the individual is thwarted in his desire to prevent that outcome, the original act itself is deemed to have been performed under duress since the effect occurs contrary to his will because a halakhic constraint has been placed upon him.

If so, a person who would seek to displace pots of water he has placed on a stove but cannot do so other than by performing another prohibited act, – i.e., by causing a pot filled with water presently located elsewhere to be placed and to remain on the stove thereby causing its contents to be cooked – would be regarded as being under *force majeure* with regard to displacing the original pots and would no longer be culpable. Hence, the proper comportment for a person finding himself in such a situation would be to do nothing. He would thus incur no culpability for his original act because he is prevented from thwarting the effect of his act by operation of Halakhah.

The same reasoning might be applied to a case in which a person places a vehicle in motion and later finds himself in a situation in which multiple individuals will be doomed unless he intervenes. Motivated by the desire to reduce the number of deaths he would cause by not intervening, that individual might seek to alter the direction of the vehicle so that it would strike only a single person but refrain from doing so because he is forbidden to initiate a new act that will result in the death of an as yet unendangered person. It would follow that he is not culpable for any

resultant death because his failure to intervene lies in his fidelity to Halakhah which commands him not to sacrifice the life of an as yet unendangered person in order to spare a larger number of victims. According to *Tosafot*, an otherwise undesired act undertaken solely because of a halakhic imperative constitutes *force majeure* with regard to any attendant transgression.

Moreover, the same would be true in a significantly altered situation in which, in the absence of intervention, the vehicle will strike a group of individuals but the person who has set the vehicle in motion can partially deflect the vehicle so that it will strike only one member of the group. He would be forbidden to do so because an individual is forbidden to engage in an act that will cause the death of one person in order to rescue others, despite the fact that the person whose death will be caused is destined to die even absent such intervention. That is so because complicity in the death of any person is forbidden even if the underlying rationale, *viz.*, “Why do you think your blood is redder than the blood of your fellow,” (*Pesahim* 25b), is not applicable.¹¹

Nevertheless, in analyzing the problem of autonomous vehicles there is an additional equation-changing factor of which one must take cognizance. The preceding discussion presumes that the person confronted with the need for a decision to intervene or not to intervene is the person who has set the vehicle in motion by turning the ignition, pressing a button or otherwise initiating the act which will culminate in tragic results. In such cases he may not intervene by sacrificing a single person either to save the many or to diminish the ultimate number of deaths for which he will be responsible. However, in the case of a veritable autonomous vehicle the “operator” of the vehicle will be powerless to make any decision. Rather, the decision will have been made by the programmer who, using programming skills, directs the computer installed in the vehicle to respond in a certain way in every contemplated contingency. Halakhic attention must be focused upon the programmer who provides instructions rather than upon the operator who is powerless to intervene.

In devising the requisite programs and algorithms, the computer programmer performs no act that leads to any loss of life, nor is he involved in any way in setting the vehicle into motion. The programmer’s attention and services are antecedently focused upon future rescue of potential victims of an accident that has yet to occur and in which the programmer will not participate in any manner.

¹¹ See *Kesef Mishneh, Hilkhoh Yesodei ha-Torah* 5:4 and R. Elchanan Wasserman, *Kovez Inyanim, Pesahim* 25b.

This problem is entirely comparable to a situation addressed by Rema, *Hoshen Mishpat* 328:2. The general rule is that a person may not cause financial harm to another in order to preserve his own property. Nevertheless, relying upon *Nemukei Yosef*, *Bava Batra* 8a, Rema rules that a person may deflect the cause of such potential damage even though financial harm will be caused to another person's property. Thus, the proprietor of a field that has already been flooded by a stream running through his property may not divert the stream to another person's field. However, if the stream has as yet not entered the former's property, he may fence off his own field even though doing so will result in the stream flooding a neighbor's property. *Shulhan Arukh ha-Rav*, *Hilkhos Nizkei Mammon*, sec. 3, similarly rules that, if soldiers have entered a city and the government demands that they be billeted by the townspeople, it is forbidden for any householder to offer a financial incentive to a military officer in order to secure exemption from that duty since it is clear that such duty will be imposed upon some other resident. Nevertheless, that authority rules that a bribe may be paid before the soldiers have entered the city for the purpose of directing the troops to travel elsewhere.¹² Citing Maharibai, II, no. 10, *Shakh*, *Hoshen Mishpat* 163:18, rules that so long as an edict has not actually been proclaimed against specific individuals, it is permissible to engage in negotiations to secure an exemption for specific parties even though it is apparent that the burden that would have been borne by those individuals will be placed upon others.¹³

It is thus clear that a person may obviate potential harm to himself even though as a result similar harm will be visited upon another. R. Ezekiel Landau, *Teshuvot Noda bi-Yehudah*, *Yoreh De'ah*, *Mahadura Tinyana*, no. 74, declares that such action may be taken, not only by the potential victim himself, but by an unaffected bystander as well. The distinction between antecedent preemption and diversion of an already-present cause of harm is the difference between an act of harm and an act of rescue. An act directing a harm to an otherwise unthreatened individual is prohibited; an act designed to exclude an individual from possible harm without directing the harm toward another is an act of rescue.

Accordingly, it follows that, in the course of manufacturing an autonomous vehicle, it is appropriate to design the vehicle to eliminate danger to a group of individuals even though a person outside that group may be

¹² See also, R. Shimon ben Zemaḥ Duran, *Teshuvot Tashbaz*, VI, no. 8.

¹³ See also R. Moshe Sofer, *Teshuvot Hatam Sofer*, VI, no. 28.

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endangered. Such a situation is entirely similar to diverting a river to prevent the flooding of a specific area. Until the vehicle is set in motion there is no danger; programming the computer in advance is an act of rescue. Accordingly, the computer may be programmed to preserve the greater number of potential victims.

A similar dilemma arises in programming an autonomous vehicle's response in a situation in which the choice is between preserving the life of the driver or the lives of multiple occupants of an approaching bus. An automobile is traveling on a narrow road hugging a cliff and a bus suddenly appears from around a bend in the driver's lane. The choice is to crash into the approaching bus or to drive off the cliff and thereby spare the lives of everyone in the bus. The driver has no right to directly cause his own death in order to spare others. Assuming that programming an autonomous vehicle is an act of rescue, the owner of the vehicle would have the duty of giving priority to saving his own life on the basis of R. Akiva's principle, "Your life has priority over the life of your fellow." Thus, the programmer of an autonomous vehicle must provide directions for responding to a situation in which a choice must be made with regard to preserving the life of the driver of the autonomous vehicle, the lives of the occupants of another vehicle or the lives of the pedestrian. The purchaser of an autonomous vehicle might justifiably demand that in all such situations the vehicle be programmed in a manner designed to give priority to preserving the life of the owner of the vehicle.

OF MIRACLE AND NON-NATURAL FOODS

It is self-evident that mock foods, despite taste, appearance and even smell, do not have the halakhic status of the food products they seek to supplant. A tofu hamburger is not to be classified as meat for any halakhic purpose. The same is true of mushroom-based chopped liver. Should scientists succeed in fashioning an edible product bearing the taste, texture, and appearance of an apple out of potato starch it would not thereby become a "fruit of the tree." Such products retain the halakhic status of the foodstuffs of which they are composed. Thus, substances such as "shrimp" cocktail containing pollock exclusively and "bacon" bits manufactured from a seasoned soy mixture are unquestionably kosher. Hamburgers made of meat produced in a laboratory are not available in the supermarket but they are no longer the subject of science fiction. Such foodstuffs are not "natural" but they stem from animal cells that are induced to grow and

reproduce in a laboratory. The halakhic question concerning the status of such foodstuffs is quite different and has been addressed elsewhere.¹⁴

It is not too early to contemplate development of foods that are entirely synthetic in the sense that they are not the result of manipulation of existing nutritional substances but the product of combination and manipulation of chemicals in a manner that precisely replicates the physical and chemical properties found in natural foodstuffs. In the interim, the consumer may, at least at times, be unable to distinguish between a hamburger and a soy burger, vegetable liver and chopped chicken liver, or between flavored pollock and shrimp. If indeed any of those pairs are indistinguishable to the palate of even a gourmet, the result is eloquent testimony to the prowess of the food engineer and/or the culinary skills of the chef. But the chemist will not be misled. In each of those cases a simple and rudimentary chemical analysis will reveal any attempt to confuse the synthetic with the natural.

The phenomenon contemplated in the present discussion is far different. It is a situation in which the synthetic is totally indistinguishable from the natural both in chemical and physical composition as well as in any other scientifically significant way. At present, such a phenomenon is no more than the fantasy of science fiction. One might dismissively – but erroneously – reject the very possibility by relegating it to the realm of the miraculous. Science and technology do not perform miracles. But it is to discussions of halakhic ramifications of miracles that we must turn for precedent and paradigm in order to address the questions attendant upon development of such synthetic foods.

The Gemara, *Berakhot* 48b, reports that Moses ordained that the first blessing of the Grace after Meals be recited after partaking of manna. R. Judah the Pious, *Sefer Hasidim*, ed. Jacob Freimann and Jehuda W. Istintvki (Frankfort a.M., 5684), no. 1640, opines that a blessing in the form of “Who brings forth bread from heaven” is the appropriate formula of the blessing to be recited before partaking of that miraculous foodstuff.¹⁵ However, those sources do not establish that any blessing must be recited

¹⁴ See J. David Bleich, “Stem Cell Burgers,” *Contemporary Halakhic Problems*, VII (Jerusalem, 2016), 55-72.

¹⁵ *Rema mi-Panu*, *Asarah Ma’amaret, Ma’amarei ha-Shabbat*, sec. 5, cites *Yoma* 52b, which reports that Joshua concealed the container of manna that Moses was commanded to preserve as a “custody unto your generations” (Exodus 16:32-33). That manna will be served at the feast of the Leviathan, when “all your generations will be resurrected” and the appropriate blessing will be recited. Cf., sources cited by R. Abraham Israel Rosenthal, *Ke-Mozei Shalal Rav*, II (Jerusalem, 5759), *Parashat Beshalah*, pp. 197-202.

upon consuming non-natural foods.¹⁶ First, in this instance, Moses may not have been transmitting a biblical rule; he may merely have promulgated a rabbinic edict declaring manna to be bread. Such an edict would have been limited to manna consumed in the wilderness. More fundamentally, Scripture itself describes manna as “bread from the heavens” (Exodus 16:4); it does not describe a miraculously created apple as an “apple.” Even if it is determined that miraculously or synthetically created foodstuffs are indeed categorized as “foods” requiring a blessing, since they certainly are not “the fruit of the ground,” or “the fruit of the tree” the appropriate blessing for all such foods would be “Who has created all things by His word.”

Apart from the issue of whether or not consumption of such foods requires a blessing, miraculous foods occasion myriad questions: Are such foods subject to tithing? Is an admixture of miraculously produced milk and/or meat prohibited? May miraculously produced flour be used in fulfilling the *mizvah* of *mazah*? May a miraculously produced *etrog*, or even an *etrog* plucked from a miraculously created citron tree, be used for fulfilling the *mizvah* of the four species? Is a miraculously created piglet kosher? Does a miraculously created calf require ritual slaughter? Does its meat require soaking and salting? The list of questions is seemingly endless.

Many relevant sources are assembled by R. Mordecai Carlebach, *Havazelet ha-Sharon*, I (Jerusalem, 5764), *Parashat Va-Yeshev*, pp. 453-458 and II (Jerusalem, 5766), *Parashat Tezaveh*, pp. 685-688. There are at least three talmudic sources that serve to demonstrate that miracle foodstuffs are treated in a manner identical with similar natural foods:

1. The Gemara, *Shabbat* 59b, reports that R. Shimon ben Halafta was the recipient of two pieces of meat that descended from Heaven. A piece of meat was brought to the House of Study and the scholars present were asked whether the meat was that of a permitted or of a forbidden animal. The response was unequivocal: “Nothing that is unclean descends from heaven.” The answer validates the question as having been entirely cogent. “Miracle meat” is indeed meat; the only issue is whether the meat is identical in status to the meat of a permitted animal or of a forbidden animal. The answer is in

¹⁶ If the blessing “Who brings forth bread from heaven” was pronounced that was so only because the blessing was ordained as a rabbinic edict by Moses. Were wheat to be synthesized in a laboratory no blessing of a comparable nature could be pronounced in the absence of a rabbinic decree. If a blessing is required it would be in the form of “by Whose word all things are created.” See *infra*, note 33 and accompanying text.

the form of a pronouncement regarding the parameters of miracles. Heaven simply does not perform a miracle in order to produce non-kosher foods. However, were Heaven to do so, the meat would be prohibited. Thus, the basic premise, *viz.*, that the meat has the status of flesh of an animal, is taken for granted. If so, any particular type of “miracle food” is halakhically tantamount to its natural counterpart.

2. The Gemara, *Menahot* 69b, questions the status of wheat that “comes down from the clouds.” *Tosafot, ad locum*, indicates that the wheat described is wheat created miraculously and transported by clouds. The Gemara seeks to clarify the import of the question: “In what connection is the question raised. If [regarding its use] for meal offerings, why not?” The Gemara concludes that the question was limited to the validity of use of “miracle wheat” for baking the Two Loaves offered each year from the newly-grown produce of the season. The query is limited to the validity of such wheat for use in baking the Two Loaves which Scripture prescribes are to be brought “from your dwellings” (Leviticus 23:17) as a meal offering from newly harvested produce. The Gemara seeks to clarify whether the phrase “from your dwellings” is designed to exclude wheat that comes from the clouds, i.e., wheat created miraculously. Here, too, the Gemara regards miracle wheat to be “wheat”; the sole question is whether use of such wheat is disqualified only from use in offering the Two Loaves by virtue of an explicit exclusion.
3. The Gemara, *Keritut* 5b,¹⁷ reports that the *shemen ha-mishḥah*, the oil of anointment prepared in the wilderness, was the subject of many miracles: “It began with only twelve *lug* [of oil] and with it were anointed the Tabernacle and the vessels, Aaron and his sons throughout the seven days of consecration and with it were anointed high priests and kings and [yet] it remains in its entirety for the eschatological era.” The Gemara herein declares that, despite depletion attendant upon ongoing use, the oil was miraculously replenished and the miraculously incremented oil continued to be used as oil of anointment. Thus, “miracle oil” is not only “oil” by virtue of being endowed with the material qualities of oil but also qualifies as “oil of anointment” by virtue of being endowed with the sacerdotal qualities of such oil.
4. In addition, the Gemara, *Yoma* 18a, foretells that in the eschatological era a narrow stream will bubble forth from under the threshold of the Temple. From there and onward the flow will become

¹⁷ See also *Horiyot* 11b.

progressively stronger and the water will rise commensurately until it reaches the entrance to the “House of David.” Upon reaching the entrance to the House of David, the stream will become a gushing river in which men and women will immerse themselves. Obviously, the enhanced, copious flow of water will be the product of miraculous generation but yet perfectly acceptable for ritual immersion.

The same principle seems to be presumed by Radak in his interpretation of I Kings 18:13. Elijah is instructed to travel to the city of Zarephat, where he is told a widow will provide him with food. Elijah comes upon the widow “and requests a piece of bread.” The widow replies that she possesses only a jar containing a handful of flour and a jug containing a small quantity of oil. Elijah insists that she bake him a small roll immediately but assures her that she will enjoy an ongoing supply of flour from her jar and oil from her jug. Radak explains that Elijah was a priest and instructed her to separate *hallah* from the bread she was baking and present it to him as a *kohen*. That comment gives rise to an obvious difficulty: There is no obligation to designate *hallah* as a gift to a *kohen* unless a minimum quantity of dough is kneaded. The threshold for incurring such an obligation is far greater than dough containing only a “handful” of flour. If so, it must have been the case that the flour in the woman’s possession increased in quantity before she baked the bread. Thus, it seems to be the case that “miracle dough” is considered to be no different than “natural” dough for purposes of Halakhah.

However, that principle seems to be contradicted by Radak himself in his interpretation of II Kings 4:7. The narrative concerns the penurious, widowed wife of one of the “sons of the prophets” who was harassed by creditors seeking payment. Elisha instructs her to pour the small quantity of oil in her possession into as many utensils as she can borrow. Upon completion of that task, “She came and told the man of God” (II Kings 4:7). The text is silent with regard to the content of the widow’s side of the conversation. What was there to tell? Obviously, the oil was provided to her to be converted into money in order to enable her to pay her debts and to sustain herself and her family. Rashi explains that she sought the prophet’s advice with regard to the mundane question of whether she should sell the oil immediately or whether she should retain the oil until its price rises in the marketplace. Radak understands her query in an entirely different vein. According to an earlier source cited by Radak, she wished to know whether the entire quantity of oil was hers to use as she wished or whether it was necessary for her to tithe the oil before using it. Her question was, is “miracle oil” subject to the obligation of tithing?

Elisha's reply, as recorded in the same verse, was, "Go sell the oil," i.e., he informed the woman that tithes need not be separated from "miracle oil" and, consequently, that she may sell the oil immediately. The inference to be drawn is that oil miraculously generated is also created spontaneously and must be categorized, not as "olive oil" which must be tithed, but as "miracle oil" not subject to tithing.

There is also an aggadic source that would seem to indicate that miraculously produced entities do not acquire the status of the entity from which they originate. In an aggadic statement, the Gemara, *Yoma* 39b, reports that when King Solomon built the Temple he planted trees of gold that subsequently yielded golden fruits seasonally. Those fruits were used by the priests to provide them with a livelihood. However, no individual is permitted to derive benefit from objects consecrated to the Temple treasury or from produce yielded by consecrated substances. Yet the Gemara states that the priests were permitted to use the fruit of those trees for their personal benefit. Accordingly, it would seem to be the case that the miraculously produced fruits were regarded as having the status of new entities unrelated to the golden trees in which they originated.¹⁸

The most celebrated example of the notion that miraculously created entities are of a category distinct from ostensibly similar natural entities is the analysis of the nature of the Chanukah miracle attributed to R. Chaim Soloveitchik of Brisk. A small quantity of oil sufficient for a single night sufficed for eight days. The problem raised over and over again by rabbinic scholars is that, if there was sufficient oil for one night, it follows that nothing miraculous occurred the first day. If so, the miracle should be commemorated for only seven days rather than for the eight-day period of Chanukah. Clearly, had the oil burned naturally each night and become miraculously replenished each morning, no miracle would have been evident the first day.

Tosafot ha-Rosh, *Shabbat* 22b, enumerates three possibilities with regard to what actually occurred the first Chanukah: 1) The oil was divided into eight parts and only one part was kindled in the *menorah* each night, with the result that a miracle became manifest on each of the full complement of eight days in that a mere eighth of the requisite oil sufficed for the entire night. 2) The entire quantity of oil was poured into the *menorah* on the first night but miraculously only an eighth of the requisite quantity was consumed each night. 3) The entire quantity of oil was placed in the *menorah* each night but miraculously each morning no oil

¹⁸ See R. Meir Simchah of Dvinsk, *Or Sameah*, I, addenda, *Hilkhot Me'ilah*, chapter 5. Cf., R. Baruch Ha-Levi Epstein, *Mekor Barukh*, II, no. 5.

was found to be missing.¹⁹ The third explanation is problematic because, since by the ninth day undefiled oil was available, there would have been no need for miraculous conservation of oil on the eighth night. If so, the commemoration of a miracle on the eighth day is unexplained.

R. Chaim is quoted as dismissing the third possibility out of hand as antithetical to the requirements of Jewish law. A qualitative miracle as a result of which oil burns more slowly and hence a lesser quantity of oil is consumed is consistent with the requirements of Halakhah: oil burned and was consumed; the miracle lay only in the rate of consumption. But if the quantity of oil in the candelabrum remained constant, it must have been because no oil was consumed. Yet, there were flames in the *menorah*. The flames could not have been the product of olive oil. Since no oil was consumed, either the flames burned without fuel or the fire fed itself on “miracle oil.” In neither of those two scenarios would the commandment have been fulfilled. Scripture explicitly states “Take unto yourself olive oil to raise a permanent lamp” (Exodus 27:20). The *mizvah* must be performed through the burning of olive oil, not by means of burning “miracle oil” and certainly not by burning no oil at all. If so, miraculously generated oil, even if identical in composition and characteristics to its natural counterpart, cannot be categorized as “olive oil” and hence cannot be utilized in discharging the obligation to kindle the *menorah*.

Resolution of the tension between these two sets of apparently contradictory paradigms rests upon proper understanding of the notion of species identification. Members of the same species differ in location and time, otherwise they would be a single entity rather than separate and distinct members of a species. In popular conception, members of a species are identified as members of the given species because they share unique common characteristics. Species identification is a shorthand reference to the common features conjured by the mind when such reference is made.²⁰ A duck is a duck because it looks like a duck, waddles like a duck and quacks like a duck. The halakhic notion of membership in a particular species is quite different. As R. Chaim famously quipped, “A horse is a horse, not because it is a horse, but because its mother was a horse.” Species identity is transmitted from progenitor to descendant. Physiognomy is irrelevant. A piglet born to a cow has the halakhic status

¹⁹ All three possibilities are cited by *Bet Yosef, Orah Hayyim* 670.

²⁰ Cf., G.W. Leibnitz, “Identity of Indiscernibles, Fifth Letter to S. Clark,” *New Essays Concerning Human Understanding*, trans. A.G. Langley, third edition (Lasalle, Illinois, 1949), VII, 293.

of a calf; a calf born of a pig is a swine. An entity that proceeds from another entity carries with it the species identity of its *Urstam*.

This is true not only of species identity but of other types of halakhic classification as well. Take the case of a sacrificial animal. There is a general rule, albeit qualified by various attendant factors, to the effect that a new prohibition cannot impose itself upon an entity upon which another prohibition has already devolved. “*Ein issur hal al issur* – a prohibition cannot impose itself upon an already present prohibition.” Think of a mop or sponge. A sponge can absorb liquid. But upon reaching the limit of its absorptional capacity any additional liquid spilled upon it will simply slough off without effect. Think of an “*issur*” as an ontological, albeit metaphysical, entity. Once it adheres to, and is absorbed by, a physical entity, the entity becomes permeated by the *issur* and sealed off from absorption of any other *issur*.²¹ The increased mass of a prohibited entity that grows or becomes engorged is infused with the same prohibition that was attendant upon the entity in its earlier, quantitatively reduced state. Furthermore, no additional prohibition can devolve upon the augmented, or enhanced mass.

The Gemara, *Hullin* 100a, states that the sciatic tendon of a sanctified animal is forbidden for human consumption as the prohibited flesh of a sacrificial animal but not as a sciatic tendon. Rashi, *ad locum*, explains that, from the earliest state of its development, the fetus gestated within the uterus of a sanctified animal acquires the sanctity inherent in its mother. At that gestational stage, the fetus is but a glob of undifferentiated tissue. Later in the development of the fetus, upon differentiation of fetal cells, the sciatic tendon develops as an emergent growth of the original tissue. Rashi explains that, since in its early, undifferentiated development that tissue was prohibited as sanctified flesh, no other prohibition, e.g., the prohibition against consuming the sciatic tendon, can devolve upon the same entity. The quantity of tissue present before the appearance of the sciatic tendon is certainly less than the quantity present when a portion of that tissue becomes differentiated and enlarged and then acquires the form of a sciatic tendon. The prohibition against benefitting from any portion of a sacrificial animal is deemed to have devolved upon the entire entity long before such newly-formed tissue comes into actual existence. The principle is comparable to the Aristotelian notion of an entelechy or a homunculus. The mature tree is present in the acorn; a miniscule man is already present in the one-cell sperm. Everything that emerges later

²¹ By way of comparison: an ovum whose cell wall has been penetrated by a sperm normally becomes sealed off and will not allow penetration by additional sperm.

(*yozei*) is already present, not only potentially, but also ontologically in the material substance in which it develops. Later-developing tissue of a sacrificial animal is sanctified tissue because it “emerges from” (*yozei*) sanctified tissue.

At this point a question must be raised with regard to the nature of miracles: Are supernaturally generated substances miraculously created *ex nihilo* or is the miracle accomplished by some form of non-natural expansion, enlargement or replication of an already existing substance? If a newly-generated substance such as oil, for example, is created *ex nihilo* then the oil is aptly categorized as “miracle oil” rather than as “olive oil.” The oil may have all the properties associated with olives but, if the term “olive oil” is understood as “the oil of olives,” the miraculously created oil is not “olive oil” because it is not derived from olives. If, on the other hand, the miracle lies simply in non-natural enhancement of a quantity of olive oil already in existence by means of mitosis, engorgement or enlargement of already-existing molecules of olive oil, the additional oil is no less “olive oil” than the originally present quantity of oil. Humans and other creatures as well as all manner of vegetation grow to maturity through the process of cell division. They increase in weight either because of cell division or because existing cells absorb nutrients and become engorged. They lose weight when the contents of such individual cells are diminished. The entity is regarded as retaining a single identity throughout its existence because its enhanced state “emerges” from its original state.

Rabbinical literature is replete with the observation that miracles, at least for the most part, occur in the form of *yesh mi-yesh, essensia ex essensia* (something from something) rather than *yesh me-ayin, essensia ex nihilo* (something out of nothing). The former is less mind-boggling because the nature of a miracle in that guise is simply a supernatural replica of a process that, when natural, is perfectly familiar. The familiar is less startling and hence less “miraculous.” Creation *ex nihilo* is astonishing – even mysterious – and indeed less than fully comprehensible to the human intellect. Those who describe miracles as occurring *essensia ex essensia* are simply stressing that the Creator chooses not to interfere excessively with qualitative aspects of the natural order nor to tax the human mind unnecessarily and therefore He causes miracles to occur in as least astounding a manner as possible. *Taz, Orah Hayyim* 670:1, cites this depiction of the nature of miracles in the name of the *Zohar* and concludes that the “blessing” of unnaturally abundant oil could not ordinarily devolve upon an empty utensil; rather, the miracle lies in the “blessing,” or enhancement, of that which is already present in the utensil. R. Meir Don Plocki, *Klei Hemdah, Parashat Va-Yakhel*, sec. 5, quotes R. Yitzchak Meir Alter of Gur,

author of *Hiddushei ha-Rim*, as explaining that, although the Creator is certainly capable of working miracles *ex nihilo*, it was halakhically imperative that the oil used for kindling the *menorah* be “oil of blessing,” i.e., *yesh mi-yesh*, because only “olive oil” may be used in kindling the *menorah* and, accordingly, “miracle oil” is not acceptable.²²

A second point must also be made with regard to species identity. The Gemara, *Hullin* 62a, and *Niddah* 50b, describes two separate fowl, a *tarnegola de-agma* and a *tarnegolta de-agma*, and declares one to be a permitted bird and the other to be forbidden. Rashi, *Niddah* 50b, understands the terms as grammatically correct references to the male and female of a single species, the sole difference being that the female was presumed to stomp its prey before eating it, i.e., the female exhibited the characteristics of a forbidden species. *Tosafot* object to that interpretation on the grounds that species identity is transmitted from mother to offspring. That principle is formulated by the Mishnah, *Bekhorot* 5b:

...a clean animal that gives birth to an unclean animal [the offspring] is permitted to be eaten; an unclean animal that gives birth to a clean animal [the offspring] may not be eaten, for that which emerges from the impure is impure and that which emerges from the pure is pure.

In explaining Rashi’s position, *Tosafot*, *Hullin* 62b, states that birds do not give birth to their young directly; rather, they lay eggs and the gestating embryos are nurtured by putrid matter within the egg. That putrid matter is categorized by the Gemara as having the status of “dust.” Thus, since the hatchling is produced by “dust,” rather than from a living creature, there is no continuity of identity between the bird and its young.

The causal nexus between the mother bird and its hatchling is severed by virtue of the fact that the egg becomes putrid and turns into “mere dust” and it is the dust that is the cause of the generation of the developing embryo. Since the hatchling’s progenitor is mere dust, it does not acquire the status of its mother by virtue of a causal connection between them, but it is accorded the status of the primordial ancestor of the species simply on the basis of its physical characteristics.²³ If so, in normal

²² Cf., R. Yehudah Aryeh Leib Alter’s analysis of the Chanukah miracle, *Sefat Emet* (New York 5716), II, 102a.

²³ Cf., *Hazon Ish*, *Yoreh De’ah* 14 (a):12. *Hazon Ish* formulates a novel thesis explaining how the male of the species to which the Gemara, *Hullin* 52b, refers may be pure and the female impure. He regards the male and female eggs as constituting separate and distinct species. *Hazon Ish* describes the egg in which the male gestates as impure “from the Six Days of Creation” and conversely, the egg from which the female develops as pure “from the Six Days of Creation.” See also *Hazon Ish*, *Yoreh De’ah* 13:11.

situations, a duckling emerging from an egg laid by a duck is kosher solely by virtue of its physical characteristics.²⁴ Unlike the rule posited with regard to mammals, the principle applicable to birds would be “If it looks like a duck, quacks like a duck and waddles like a duck, it is a duck.” Conversely, an eaglet that emerges from the egg of a duck is non-kosher because it exhibits the physical characteristics of an eagle. *Ba'al Halakhot Gedolot*, as cited and endorsed by Ramban, *Bekhorot* 6b, declares that a bird having the characteristics of a non-kosher species that hatches from an egg laid by a kosher species is non-kosher.²⁵ *Bet Me'ir*, *Yoreh De'ah* 86, and *Imrei Binah*, *Hilkhot Terefot*, no. 11, assert that this is also the view of Ran, *Hullin* 64b.²⁶ The hatchling, then, is in effect regarded by these authorities as arising *sui generis* with a status identical to that of its primordial progenitor. Hence, according to Rashi, a duck hatched from an egg laid by an eagle would be regarded as kosher while an eaglet hatched from the egg of a duck would be non-kosher. *Or Zar'u'a*, *Hilkhot Terefot*, no. 436, apparently espouses Rashi's view in maintaining that a forbidden bird is prohibited because its progenitor was a member of an impure species. *Or Zar'u'a* declares, “an impure bird is forbidden even though it develops from dust because such is the decree of the King.”

Since species identity is transmitted from ancestors to progeny, the physical characteristics of rumination and split hooves are irrelevant in determining the *kashrut* of contemporary animals. The animals described in Scripture as kosher by virtue of physical criteria are either those that were in existence at the time of Revelation at Sinai or, more likely, the references denote animals that came into existence on the sixth day of creation and became the progenitors of the various extant species. Clearly, there were primordial horses either at creation or at Sinai that were prohibited, not because their ancestors were horses, but because they were created as horses. It is only the young born of such a horse that is a horse by virtue of *yotzei*, i.e., because its mother was a horse.

²⁴ Identification of particular physical characteristics that define any specific avian species is beyond the scope of this discussion. Suffice it to say: 1) Only the species specified by Scripture as impure are prohibited. Hence, the characteristics of the twenty-four non-kosher species enumerated by Scripture need be identified; all other species are kosher. 2) The physical characteristics enumerated by the Sages as associated with non-kosher species and recorded in *Shulhan Arukh*, *Yoreh De'ah* 862, e.g., the bird feeds by means of *derisah*, may be necessary physical attributes of the species but do not necessarily exhaust the physical characteristics that define a phenotype.

²⁵ See R. Nathan Gestetner, *Le-Horot Natan*, vol. 7, no. 58.

²⁶ Ran is understood differently by *Pri Hadash*, *Yoreh De'ah* 86:18.

Thus, according to Rashi, a cow or a horse miraculously created *ex nihilo* would have the status of a primordial cow or horse, a status to be determined on the basis of physical criteria rather than ancestry. It would then follow that a miraculously created horse is non-kosher while a miraculously created cow or sheep is kosher. The latter would require ritual slaughter because, although it is a “miracle cow,” it is no less a cow than the primordial cow. Species identity of a primordial animal was performed innate rather than the result of transmission by a progenitor.²⁷ These two principles taken together serve to reconcile the seemingly contradictory sources pertaining to the identity, and hence the halakhic status, of newly-created entities. A newly, or miraculously, created animal or inanimate object is indeed “primordial.” The halakhic status of such an entity is determined by its physical characteristics in a manner quite similar to that which served to endow all created entities with unique identity during the six days of creation. Thus, animals that descend from Heaven and miraculously created kernels of wheat are categorized on the basis of phenotype. A calf created *ex nihilo* that is perceived by the beholder to have the full complement of characteristics of a calf is a kosher animal and would require ritual slaughter. As reported in *Shabbat* 59b, there is also a received tradition that informs us that a non-kosher animal will not be the object of miraculous creation. By the same token it would follow that a miraculously created animal endowed with a phenotype identical to that of a primordial animal of that species requires ritual slaughter just as an animal present in the Garden of Eden that had somehow managed to survive to the present day would require ritual slaughter.

There is no need to determine the nature of the miracle involved in the accretion of quantities of oil described in II Kings. Either new molecules of oil were created *ex nihilo* or, alternatively, accretion of the oil was the result either of engorgement of existing molecules of oil or was the product of mitosis of existing molecules. If created *ex nihilo*, even if such molecules of oil were endowed with every conceivable characteristic and quality of naturally produced olive oil, they would not have been subject to tithing because tithing is required only of oil produced from olives grown in the soil of the Land of Israel. “Miracle oil” is not derived from olives grown anywhere and certainly not from the soil of the Land of Israel. If the olive oil was simply a miraculous replication of existing oil it is

²⁷ *Tosafot*, *Niddah* 50b, disagrees with Rashi but not necessarily because of rejection of the underlying thesis with regard to species identity of primordial animals but because *Tosafot* regards the plain meaning of *tarnigola* and *tarnigolta* as being the male and female mode of reference to members of a single species.

to be presumed that the originally present quantity of oil had already been tithed. Since the original oil was exempt from further tithing, any oil that might have emerged from already tithed oil would have enjoyed an identical status and would have been regarded as already tithed oil.

Nor is the nature of the miracle significant in understanding Radak's interpretation of I Kings 18:13. The biblical obligation with regard to *hallah*, i.e. the small portion of dough that must be presented to a *kohen* as described in Numbers 15:18, is also an obligation devolving upon produce of the Land of Israel as specified in the introductory phrase of that verse, "When you shall come to the land to which I bring you." The obligation of *hallah* with regard to bread or dough produced from grain grown in the Diaspora is rabbinic in nature. However, as recorded in the Mishnah, *Hallah* 2:1, produce originating outside the Land of Israel that enters the boundaries of the Land of Israel becomes biblically obligated to *hallah* as specified in the following verse, Numbers 15:19, "And it shall be that when you eat of the bread of the land...." That verse and the rule derived therefrom as recorded in the Mishnah are understood by the Gemara as referring to produce grown in the Diaspora and subsequently made into bread by kneading it within the territorial boundaries of the Land of Israel. Thus, any dough kneaded in the Land of Israel is subject to the obligation of *hallah*, simply because, in the words of the Mishnah, the produce has entered the Land of Israel.²⁸ There is scant difference whether the produce enters the Land of Israel from contiguous territory or enters miraculously by descent from Heaven. In either case the obligation is occasioned by kneading the dough in the Land of Israel.²⁹

However, the nature of miracles is crucial in understanding the miracle associated with the *shemen ha-mishḥah* and in kindling the *menorah* in the time of the Hasmoneans. The term "*shemen zayit* – olive oil" lends itself to two interpretations, both in Hebrew and in English. It

²⁸ Optimally, *hallah* is separated from the dough before baking but it can also be separated from the baked product before it is eaten. R. Aryeh Pomeranchik, *Torat Zera'im*, *Hallah* 3:8, demonstrates that *Teshuvot ha-Rashba*, I, no. 54, maintains that there is no obligation of *hallah* with regard to dough brought into Israel until it is actually baked into bread. R. Mordecai Carlebach, *Havazelet ha-Sharon*, I (Jerusalem, 5765), *Parashat Va-Yeizei*, pp. 455-458 and *Parashat Va-Yeshev*, pp. 840-841; II (Jerusalem, 5766), *Parashat Tezaveh*, pp. 687-688; and IV (Jerusalem, 5767), *Parashat Be-Ha'alotekha*, pp. 381-382, astutely notes that I Kings "make me a small *ugah*" denotes a small baked product as in "*ugot mazot*" (Exodus 12:39) and comments that, in accordance with the rule governing dough brought into Israel from outside its boundaries, Elijah instructed the woman not to designate a portion of the dough as *hallah* until after it had been baked.

²⁹ *Havazelet ha-Sharon*, II, *Parashat Tezaveh*, p. 688.

may represent a compound noun, or more accurately, a genitive form meaning “oil of an olive,” or “olive” may actually be an adjectival modifier of the word “oil.” The difference is clear: there can be no “oil of an olive” unless the oil is derived from an already existing olive. “Olive oil” denotes simply oil that has the properties and characteristics of olive oil as opposed to other oils. Olive oil generated by a miracle may be indistinguishable from oil of naturally grown olives, but “oil of an olive” it cannot be (unless of course, it is obtained by pressing olives that have been created miraculously).

The biblical verses describing the *shemen ha-mishḥah*, the oil of anointing, refer simply to “*shemen*,” or “oil,” which in biblical Hebrew denotes olive oil. The nature and characteristics of “miracle oil” may well be identical to those of natural oil. If such is the meaning of “oil” then, in that context, there is no reason to exclude “miracle oil.”

In contradistinction, the oil prescribed for use in kindling the *menorah* is “*shemen zayit zakh* – pure olive oil” (Exodus 27:20). As understood by R. Chaim and *Hiddushei ha-Rim* the phrase is to be rendered as “pure oil of an olive,” i.e., oil derived from olives. Miraculously created oil is clearly not derived from olives. The matter becomes even clearer when the ensuing phrase is taken into account: “*katit la-ma’or* – pressed for giving illumination.” Most assuredly, “miracle oil” cannot be described as “pressed” since miraculously generated oil requires no pressing. Indeed, as R. Chaim noted, Scripture specifies “oil of an olive,” not “oil of a miracle.”

In the messianic age, the narrow trickle of water emerging from the Temple precincts will appear as gushing water as it approaches the City of David. That water will be newly created rather than an accumulation or augmentation of existing water. As shown earlier, miraculously created entities have the same status as natural primordial entities. Consequently, flowing “miracle water” can be used for purposes of immersion. Since such waters are newly created they do not have the status of sanctified Temple property. Temple property is sanctified only if dedicated to the Temple treasury by man. Unlike any possible accretion of natural water, miraculous or otherwise, newly-created water is created without any prior act of human consecration. Since such water is unconsecrated it may properly be used for ritual immersion.

Similarly, gold trees do not produce edible fruit by means of any causal relationship, either natural or supernatural. The miracle lies in the appearance of fruit *sui generis*. Those fruits are not the outgrowth or product of a consecrated object. Since their genesis was not in a consecrated object, nor have they themselves been consecrated, those fruits were permitted “sustenance for the priests.”

If the foregoing thesis regarding “miracle foods” is accepted, it then follows that any plants, fruits or even animals produced synthetically in a laboratory and endowed with the characteristics and attributes of the natural foods they emulate would have the status of primordial entities. Thus, the calf created each *erev Shabbat* by R. Hanina and R. Oshia, as recorded in *Sanhedrin* 66b, would require ritual slaughter, soaking and salting.³⁰ The principle of *yotzei* would apply to fruits and vegetables produced from parts of existing fruits or vegetables. They would acquire the status of the species from which they are reproduced and the appropriate blessing would be recited.³¹

In the case of species used for *maror*, such products might be used for fulfilling the *mizvah* of partaking of bitter herbs on Passover eve.³² The same should be the case with regard to totally synthesized fruits and vegetables in the unlikely eventuality that their chemical and physical

³⁰ This is a matter of extensive discussion among latter-day authorities. See, *inter alia*, R. Abraham Meyuchas *Teshuvot Sedei ha-Arez*, *Yoreh De'ah*, no. 1 and R. Chaim Pelaggi, *Ruah Hayyim*, *Yoreh De'ah* 1:18, cited by *Darkei Teshuvah*, *Yoreh De'ah* 1:11; *Sedei Hemed*, *Asifat Dinim*, *Hamez u-Mazah*, no. 2, sec. 3; R. Isaiah Horowitz, *Shnei Luhot ha-Berit*, *Torah she-be-Ktav*, *Parashat Va-Yeshev*; *Pithei Teshuvah*, *Yoreh De'ah* 62:2; R. David Abraham Mendelson, *Pardes Yosef be-Hadash*, 14:23 and 29:11; and R. Mordecai Carlebach, *Havazelet ha-Sharon*, I, 840-841 and IV, 381-382. The authors who maintain that such animals do not require ritual slaughter or who disagree with regard to hydroponic produce, *infra*, note 31, would not accept the thesis presented herein.

It would seem that the status of “cow meat” or hamburger produced in this manner would be questionable. Since the product is not derived from a living animal it could not be *nevelah* or carrion because of the absence of *shehitah*. However, by the same token, it is “*eino zavuah*,” i.e., not slaughtered. Some authorities regard *eino zavuah* as a distinct prohibition. See *Tosafot*, *Bei z'ah* 25a, s.v. *be-hezkat issur*. It is questionable whether the prohibition of *eino zavuah* can be attendant upon meat that was never part of a living animal. In all likelihood, as a *lav ha-ba mi-klal aseh*, a negative commandment derived by inference from a positive commandment, the prohibition of *eino zavuah* applies only when *shehitah* is an empirical possibility.

³¹ “An impure species does not descend from heaven” (*Shabbat* 59b). But assuming such a species could emerge from a laboratory it would have the status of a primordial non-kosher animal of that species. Moreover, a synthetic animal having no natural counterpart but lacking in split hooves and rumination would also be forbidden.

³² Indeed, it seems to this writer that presently available hydroponically grown romaine lettuce produced from germinating seeds are the *yotzei* of the original natural species for all halakhic purposes. For a discussion of hydroponically grown foodstuffs see R. Shlomoh Zalman Auerbach, *Zot ha-Torah*, *Birur Halakhah*, no. 24; R. Samuel ha-Levi Wosner, *Teshuvot Shevet ha-Levi*, I, no. 205; and R. Moshe Sternbuch, *Teshuvot ve-Hanhagot*, II, no. 149. Cf., R. Aryeh Hier, “The Bracha for Hydroponically Grown Produce,” *Journal of Halacha and Contemporary Society*, No. 17 (Spring, 1994), pp. 112-119.

characteristics are identical to those grown naturally, save that the blessings “Who brings forth fruit of the tree” and “Who brings forth fruit of the earth” would not be appropriate. The identical principle would apply to grains from which bread is baked. The appropriate blessing for all such foods would be “by Whose word all things are created.”³³

³³ See *supra*, note 16.