

HALOCHOSCOPE

May one break a glow stick on *Shabbos*?

A glow stick is a plastic tube that can be 'snapped' to make it light up. No fire or power is needed. The light lasts for a period depending on the size and temperature of the tube. If it is cold it will last longer with low light; if hot, it will be brighter but will lose its light sooner. It is used by campers and can also be used for night entertainment.

The stick is made up of a sealed tube filled with a solution in which floats a glass vial of hydrogen peroxide. When the tube is 'snapped' the vial breaks and releases the hydrogen peroxide into the other solution. The chemical reaction creates new chemicals, which, in turn, eventually decompose into carbon dioxide. This releases energy to fluorescent dye atoms in the solution, exciting its electrons to move faster and further from the nucleus. When the electrons drop back into their usual orbit they give off light.

No power or heat is used to cause this light. Is it permitted on *Shabbos*? Before the vial is broken, the stick is an unfinished utensil. Could finishing it be considered a *melacha* of some kind? Mixing the solutions to create the new compound, especially since it causes the type of reaction that produces the light, might be considered another kind of *melacha*. There is also a dye involved, giving the resultant stick its color.

The issues:

- A) *Hav'arah*, the *melacha* of igniting
- B) *Bishul*, cooking in its various *melacha* and non-*melacha* forms; *Molai'ach*, salting
- C) *Tzovaia*, dyeing
- D) *Makeh bapatish*, final blows to form utensils; *Tikun kli*, fixing a utensil
- E) *Nolad* and *Molid*, bringing into existence something new

A) *Hav'arah*

Kindling a fire is Scripturally forbidden on *shabbos*. Is the prohibition against the consumption of the fuel or against the production of the fire or light, or heat through burning? For example, if it were possible to kindle a fire that would not consume the fuel, would it be considered the *melacha*? Concerning the 'burning bush' the fire is called a fire, and the term for 'burning' is used in the way it is used to describe the *melacha*, yet the bush is not consumed. This could be the reason the matter was considered extraordinary. [See Avnei Nezer O.C. 238. Sfas Emes Psachim 75a. Tzitz Eliezer I:20.]

Only one type of light is produced by heat, called incandescence. Fluorescence and phosphorescence are produced without consuming anything. They result from radiation energy. Eventually, there is some consumption, but it is not through combustion or heat. The energy supplied to cause the radiation could involve combustion, and would therefore involve *hav'arah* on some level, such as in the case of electric fluorescent light bulbs. The light of the glow sticks is also not produced by heat or fire. It is a third form of light called chemiluminescence. The chemicals are indeed consumed, in the sense that they break down. Does decomposition qualify as burning, since no heat or fire is used to

produce it? [See references to Halochoscope I:4 7 11, II:10 36, III:7 10 23, etc.]

Assuming that producing light without *hav'arah* is not Scripturally a *melacha*, could it be forbidden Rabbinically? Is it forbidden Rabbinically to cause static electric flashes? Activities that do not produce a lasting effect are not forbidden Scripturally, but some are forbidden Rabbinically. Another example would be the glow sticks in our case.

B) Bishul; Molai'ach

The *melachos* forbidden on *shabbos* were all in some way performed in the construction of the *mishkan*, tabernacle in the wilderness. *Bishul*, cooking, was involved in preparing the *samemanim*, ingredients in the dyes used for the cloth.

Scriptural *bishul* is limited to a process using heat to harden soft material or to soften hard material and thus make it fit for a new use. Many poskim include melting metal, wax, butter or tar, and hardening earthen vessels by heating them in this category. Placing a fresh piece of wood in an oven where it will dry out is also included.

Bishul is only forbidden Scripturally *derech bishul*, when done in the normal way. This excludes using the heat of the sun, because it is not reliable or controllable. Cooking in direct sunlight is permitted, while using heat collected from sunlight is forbidden Rabbinically. It could get confused with indirect man-made heat. Could a case be made to Rabbinically forbid chemiluminescent light due to the confusion with incandescent light? Or could we say that just as direct sunlight is not confused, and permitted, direct chemiluminescence would also be permitted?

Pickling food is Rabbinically forbidden as a related process to *bishul*. It qualifies as cooking in other *halachic* situations. It also prepares raw food for eating instead of cooking it. Salting qualifies as roasting for some *halachic* situations. It is also related to the *melacha molai'ach*; *me'abed*, tanning raw hides with chemicals, or *molai'ach*, salting using regular salt, processes the hide as leather or parchment. Salting foods is forbidden Rabbinically. Making saltwater is also forbidden. This looks like salting, or is part of the preparatory process of salting foods. This is *uvda dechol*, mundane activity usually done during the week that reduces the sanctity of *shabbos*. Making a minor amount is allowed. It is clear that it is not done to salt foods, but to add as a flavor. Adding wine to vinegar, making the new wine into vinegar, is also forbidden. Some consider it like pickling, while others say it is *uvda dechol*. Is mixing non-foods to change them through chemical reaction included in these Rabbinical extensions of the prohibitions? It might seem like *uvda dechol*, but since it was not decreed on, may we add it to the prohibition ourselves? [See Shabbos e.g., 38b-42b, 108a, Poskim Tur, Sh. Ar. O.C 318 321:2-6, commentaries.]

C) Tzovaia

In the *mishkan*, the *melacha* of dyeing is commonly connected to the *techailless*, the blue (indigo) wool, dyed in the manufacture of the drapes. The Yerushalmi relates it to the manufacture of the red drapes made of ram hides. The animal bodies were bruised before skinning so that the hides would turn red. According to some, this shows that even if the process does not change the color but deepens the existing color it is Scripturally *tzovaia*. Bruising a live animal by hitting it is also considered *tzovaia* by some poskim.

Changing the color of non cloth items is forbidden as a *tolda* of *tzovaia*. This includes adding pigment to a bowl of water. If the water will later be used to dye, some are of the opinion that the *melacha* has not yet been completed. It would not be forbidden

Scripturally but Rabbinically. Mixing the ingredients for dye or ink could be forbidden Scripturally as a different *melacha*, *megabel*, a stage of *lash*, kneading.

In our case, the chemical reaction causes the solution in the plastic outer tube to give off colored light, from the fluorescent dye. Is the dye coloring anything new? In reality, only the dye electrons give off the light. The dye does not color new material, but it begins to glow. Thus, it is deepening an existing color. The solution in the outer tube might not have the color of the dye before the vial is broken. It is colored as a result of the 'snapping'. Accordingly, there is an issue of *tzovaia* in our case, whether by deepening a colored item or coloring a colorless or white item.

The fluorescent dye can sometimes color as a part of the larger reaction. Dyes are often produced from components of different coloration that only get the dye color after reacting with each other. In our case, it is possible that the tube, solution or dye itself already has a color of its own. Changing something from one color to another is not the same as dyeing a white or clear item. A white cloth that is dyed is enhanced, while a colored cloth that had its original color changed might not be considered enhanced. Therefore, a neutral activity leading to the dyeing might not be a *melacha*, under the guidelines of *psik raisha delo nicha lai*, unwanted inevitable unintended result. In fact, in many cases, it could be considered *derech lichluch*, done in a way that spoils the item, rather than enhancing it. However, in our case, the dyeing is clearly intended. It also could not be considered spoiling the tube. In fact, dye made by mixing different colored ingredients to form a third color is considered the Scriptural *melacha* of *tzovaia* by some poskim. The others disagree only because it is not finished until the cloth is later dyed.

A light stick might be available that has no dye in it. The glow would be the color of neutral material. Assuming that there is no specific intent to cause a color to come to the fore as a result of the reaction, it might not be considered *tzovaia* in this case. Lighting it up and 'deepening' it would indeed pose a *tzovaia* problem. If, however, an initial color was preferred and an unwanted color emerged as a result of the reaction, it could be permissible. The resultant new color would then be deepened and enhanced by the glowing, and this is clearly desired and intended. But the dyeing aspect began as an unwanted inevitable result. What took place later was indirectly caused by the original action. Therefore, it could be considered an activity that began as a *psik raisha delo nicha lai* and ended as a *grama*. Nonetheless, this is not relied on ideally, but in pressing situations. [See Shabbos 73a 75b 94b-95a 107a, Yerushalmi 7:2, Rambam 9:13-14, Raavad. Tur, B.Y., 252:1 320:20 328:48, commentaries.]

D) Makeh Bapatish; Tikun Kli

Forming a utensil is forbidden on *shabbos*. The *melachos* associated with this are *boneh*, building, and *makeh bapatish*. *Boneh* applies primarily to structures built on the ground. Very large utensils made to remain stationary are often included in this. Activities involved in fashioning regular utensils are not usually *boneh*, and dismantling them is not *sosair*, demolishing. Obviously making a *kli* involves *melacha*. Along the way, melting, cutting, gluing etc., are considered separate *melachos*. Completing a *kli* is considered *boneh* by some poskim. The finishing touches in the manufacture of an item constitute a separate *melacha*. A pot formed of metal is smoothed with a hammer, *makeh bapatish*. *Tikun kli*, repairing, is forbidden, sometimes Scripturally, and sometimes Rabbinically.

cally. [See Shabbos 31b 41b 47a-48b 74b 102b-103a 122b 146a-b, Eruvin 35b- 36a, Beitza 10a 11b 22a 33b, Poskim. Tur, B.Y. Sh. Ar. O.C. 314, 317, commentaries.]

For example, one may not fill an unfilled pillow or thread a shoe-lace that was not threaded before *shabbos*. A handle may not be attached to a tool. In our case, the tube is practically useless before the vial inside is broken. While breaking it might not be true *sosair al menas livnos*, demolishing in order to build, this is definitely an activity that brings the utensil to its intended use. It is, at the very least, the final touch.

E) *Nolad*; *Molid*

Anything not intended for use on *shabbos* when *shabbos* began, for a variety of reasons, can be *muktzeh*. *Nolad* is essentially a type of *muktzeh*. It was 'born' on *shabbos* or *yomtov*. Nobody could have it in mind before *shabbos* since it did not exist. Therefore, it is *muktzeh*. Cases of *nolad* include newly born animals, freshly laid eggs, milk milked on *shabbos* and ashes from a fire that was kindled on *shabbos*.

A further type generally considered *nolad* is a drastic change made to an existing item. Examples include cloth sewn (by a gentile) into a garment, or a glass bottle broken such that it can no longer be used for its original purpose. Water evaporates into clouds, then condenses as rain. The Talmud entertains the possibility that this is *nolad*, but concludes otherwise. However, the Talmud forbids crushing snow and ice to produce water. Some explain it as a look-alike to *makeh bapatish*. Others consider it a Rabbinical form of *sechitah*, squeezing fruit. A third view considers the water *nolad*. The activity of making something *nolad* is similar to *melacha*. Thus, though it can not be categorized as any *melacha*, it is forbidden Rabbinically as a collective *molid*.

Based on this, melting other solids, like hardened fat, or using solid or thick soap is forbidden. In our case, there is no doubt that the item in question has been altered to a new level. The actual process is a chemical reaction resulting from simply mixing two solutions, but it is done intentionally to create the third new solution that will make the stick glow. It would appear to involve *molid*. [See refs. Halochoscope I:27 46, VIII:16.]

In conclusion, it seems that many problems are involved in breaking the glow stick. It would seem to be forbidden, at least Rabbinically, and possibly Scripturally.

On the Parsha ... *Ve'aish mislakachas besoch habarad ...* Some say that fire or lightning came down intermingled with the hail. Others say that each hailstone had fire in it. The Medrash says it was either half ice half fire, or the ice 'contained' the fire. The damage was done, according to some, partly by the force of the hail and partly by the fire. Others say the damage was done by the hail alone. The *makah* is *barad*, hail. If so, why was it necessary to have fire inside? While it was miraculous, all the other *makos* were miraculous concentrations of natural phenomena. [The Egyptians had a chance to explain them away as 'a natural catastrophe'.] Some explain the fire as an electric charge [see Malbim]. Thus perhaps the hail caused the damage, but was extra dangerous because of its electric charge. Perhaps the fire was due to a chemical reaction taking place inside the hailstones, like inside a glow stick. This chemical was a dangerous material that helped cause the destruction. The cold of the ice slowed the reaction so that it would not end before the damage would be done. It was indeed the miraculous hail that did the damage.

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