The Laws of Bishul (Unit #11)

Varying sources of heat

Unit #23

In this series that studies the halachot pertaining to cooking on Shabbat, we have mentioned "the heat source" countless times, without specifying what source is being used.

In the past, fire was practically the only source of heat used for cooking. Nowadays we have several other methods – from microwaves to chemical reactions that radiate heat.

Is there a Halakhic distinction between these methods? This unit will analyze that question, and define the implications to various heating methods.

א. Heated by sun or fire

The Mishna quotes a machloket about cooking in ways that are not standard:

משנה מצסה שבת פרק ג מסכת שבת

The Tanna Kama says that placing an egg beside an urn or on a hot cloth on Shabbat is prohibited. Rabbi Yossi disagrees, saying that cooking in that way is allowed. It seems that Rabbi Yossi allows cooking with un-standard heat sources. But the Mishna ends with cases that the tanaim seem to agree that are prohibited – secreting in hot sand or dust.

The Gemara adds another Beraita, that allows cooking in the sun:

תלמוד בבלי מסכת שבת דף לט עמוד א

Rav Nachman defines the parameters of the machloket:

אמר רב נחמן: בחמה - דכוליה עלמא לא פליגי דשרי, בתולדו ת האור - כליה עלמא לא פליגי דאסיר, כי פליגי - בתולדות החמה; מר סבר: גזרינן תולדות החמה אטו תולדות האור, ומר סבר: לא גזרינן

Rav Nachman explains the distinction:

משה מצסה שבת דף עמוד א

Amar Beth Tannaim - Ḥolot ha-Avot - קולא עלמא, ועון גזרינן - תולדות החמה. האור: מושרת, ומר סבר: לא גזרינן.
Unit 23 – Varying sources of heat

The difference between cooking with the sun and using other heat sources is evident; the sun is easily identifiable as the source of the heat. But an item that has been heated by the sun rays is not necessarily identifiable as something that was warmed up by use of the sun rays, as opposed to any other source. Use of something that was warmed up using other means is an isur de'Oraita, as we can deduce from the previous Sugia (that we began in unit 19)!

Rav Nachman explains as follows:
All agree that cooking with fire, or with an item that was heated by the fire, is prohibited.
All agree that cooking in the sun is allowed, as the Beraita stipulates.
They also agree that there is no Torah prohibition of cooking with something that was heated by the sun. The machloket regards whether there is a Rabbinic gezera on cooking in that way.

Rashi explains why it makes sense to constitute such a gezera:

Using warm water to cook is an isur de'Oraita, despite the original flame not taking part in the actual cooking. Mar Brei De'Ravina deduces from this that cooking with a secondary heat source is also an isur de'Oraita. This led the Rambam to include both laws in the same paragraph:
Unit 23 – Varying sources of heat

Concentration of the Sun Rays

Cooking with sun rays is allowed on Shabbat. Is this true also if the sun rays have been tampered with? For example, if glass is used to concentrate the sun rays onto a single point, thus creating a lot more heat than would naturally occur, would that be considered cooking with the sun rays as well?

The Halachot Ketanot says that centralizing the sun rays, thus creating a spark, is considered a derivative of the sun, and is therefore prohibited.

Shevitat Ha'Shabbat analyzes this ruling, pondering the meaning of the word "spark":

If we are referring to an actual spark, Shevitat Ha'Shabbat says that should be an isur de'Oraita — once we are cooking with fire, why should there be any difference between cooking with fire from matches, stones, or the sun?

On the other hand, if there is no spark, but just a greater centralization of the sun rays, he isn’t sure that would be considered as derived from the sun, and not the sun itself.

Rav Waldenberg points out that even Shevitat Ha'Shabbat’s uncertainty was due to the use of the pot or dish that was warmed by the sun. He says that use of direct (albeit redirected) rays are definitely considered use of the sun itself:

Solar Water Heating

The most common use of cooking with the sun rays is used in solar water heating. To quote Wikipedia:

Solar water heating (SWH) is the conversion of sunlight into heat for water heating using a solar thermal collector. A variety of configurations is available at varying cost to provide solutions in different climates and latitudes. SWHs are widely used for residential and some industrial applications.

A sun-facing collector heats a working fluid that passes into a storage system for later use. SWH are active (pumped) and passive (convection-driven). They use water only, or both water and a working fluid. They are heated directly or via light-concentrating mirrors. They operate independently or as hybrids with electric or gas heaters. In large-scale installations, mirrors may concentrate sunlight into a smaller collector.

We will discuss only the simple systems, in which the sun rays are concentrated, the panels are closed in, thus creating a greenhouse effect, in which the heat accumulates but does not escape. Therefore the sun’s heat is what is heating the water in the pipes. Once hot, the water rises and is held in the water tank.

1 https://en.wikipedia.org/wiki/Solar_water_heating#Solar_water_heating_(SWH) is the conversion of sunlight into heat for water heating using a solar thermal collector. A variety of configurations is available at varying cost to provide solutions in different climates and latitudes. SWHs are widely used for residential and some industrial applications.

Questions and comments may be sent to: info@eretzhemdah.org
There are two Halakhic issues that need to be addressed regarding using solar water heating on Shabbat:

1. When running the hot water tap, hot water comes out of the tank, and new water comes in. If the new water is cold, it will get heated by the water in the tank. Are we allowed to cause such heating on Shabbat?

2. By the time the tap is turned off, new, cold water will have filled the pipes, water that will now be heated by the system. Is one allowed to cause that heating to happen? In order to answer that question, we must first determine whether the system is considered cooking with the sun or its derivative.

Is warming the water in the solar water system considered cooking with the sun, or its derivative?

Rav Waldenberg says that use of the solar heating system is no different from using a magnifying glass to focus the sunbeams on a particular point:

There is no distinction between heating water with a magnifying glass and heating water with a solar water system. The heat comes directly from the sun, and the water is heated independently of the sun's heating of the tank. The only difference is that the heat is generated by a device that focuses the sun's rays.

Rav Frank says that the water entering the tank is heating up from water that was heated by the sun, which is a **de'Rabanan** prohibition!

Despite this, the Poskin raise two reasons for leniency:

Is the **gezera** applicable to solar water heating systems?

Rashi explains that the reason for the **gezera** on things that were heated by the sun is that one cannot recognize the heat source. For example, if iron is heated up by fire or by the sun, and then used to boil water, what people see is hot iron, not the fire nor the sun.

But what about cases in which the heat source is easily identifiable? The Maharash refers to such a case – if a metal roof is heated by the sun, he says that one may cook on the roof, and the **gezera** does not apply, since it is evident that the roof was heated by the sun!

Many Poskim disagree:

The Magen Avraham says that the Yerushalmi seems to prohibit such cooking.
The Minchat Yitzhak says that, based on this, use of such a system on Shabbat would be a Makhloket between the Maharshar and the Magen Avraham:

Rav Kapach explains why he thinks the Magen Avraham would agree to be lenient in this case:

Rav Kapach says that the Magen Avraham only prohibited using things that have been heated in the sun, and can go on cooking in the sun’s absence. The solar heating system does not work in the sun’s absence, and therefore cannot be within the parameters of the gezera.

The Minchat Yitzhak quotes a Rashba that seems to refute this:

Rav Kapach points out that the Rashba appears to support the leniency argument.

The Rashba writes (in a different context) that sand and dust would not cook anything in the sun’s absence. Regardless of the physical accuracy of this claim, it seems that the Rashba thought the gezera applies also to items that would not be able to cook in the sun’s absence!

GRSZ Aurbach is quoted saying that there is further reason for stringency in the case of the solar water heating system:

Turning the hot water tap looks no different, whether it is causing hot water to come from a solar heating system, or other systems that may cause a de’Oraita-level offence!

On the one hand, this is a new gezera, and would require all of the Rabbis to convene and agree on.

On the other hand, his point is valid and important. If we were to allow use of the solar water heating system, we must be doubly cautious that people do not confuse use of that system with others!

The Poskim raised a more fundamental reason for leniency:

Psik Reisha de’Rabanan

As we said, turning the hot water tap on will inadvertently cause new cold water to enter the system and heat up. This kind of action, where there is no intention of the secondary outcome, yet the prohibited outcome is inadvertent, is called a psik reisha (literally based on the sarcastic response to one who would like to chop an animal’s head off while not anticipating the secondary result if its death). We deem psik reisha to be prohibited. But does the same apply to transgressions that are de’Rabanan? An elaborate discussion may be found in the h Rachot:?
Most Poskim agree that if three requirements are met, the act is allowed:

1. The secondary outcome is unintentional.
2. The secondary outcome is a *de’Rabanan* transgression.
3. The actor does not benefit from the secondary action.

If the person has no need for more hot water, he doesn’t benefit from it. If he needs more hot water, the most effective way of getting it is by having the water not go directly into the tank, but rather stay in the pipes of the solar heating system, thus getting properly heated themselves (instead of getting heated by mixing into the hot water, which would not be nearly as effective in heating them). Therefore, the Poskim agree that it is a *psik reisha* in which the secondary is both *de’Rabanan* and of no benefit to the perpetrator, and therefore is allowed.

**Summary of the discussion about use of the solar water heating system on Shabbat:**

1. **Is the system cooking with the sun or its derivative?**
   - Rav Waldenberg explains that the system traps and uses the sun’s heat more effectively, but ultimately only the sun’s heat is heating the water, and is therefore allowed.
   - The Maharshal says that in cases in which the use of the sun is discernible, the *gezera* does not apply. The Magen Avraham disagrees, and so the Minhat Yitzhak says that we should be stringent. Rav Kapach explains that in this case the Magen Avraham would be lenient as well, since the system does not work in the sun’s absence.
   - GRSZ Aurbach raised the opposite reason for stringency: turning the hot tap on looks no different, regardless of the heating system being used. Therefore, we should be doubly cautious and not allow use of water heated by the sun (we pointed out that this is a new *gezera*, but should be cautionary).

2. **Psik Reisha *de’Rabanan* that does not benefit the perpetrator:**
Heating up cold water with the water in the tank is a de’Rabanan prohibition, since that water was warmed by the sun. The act of warming the new water is unintentional (albeit inadvertent), and does not benefit the perpetrator, and is therefore allowed.

1. **Why is cooking with the sun allowed?**

We saw earlier Rashi’s explanation, that use of the sun for cooking is not a regular way to cook:

> דשייר – דאף דר מים בכרכ

This explanation is far from adequate.

First of all, cooking with something that was heated by the fire is also not ordinary, and yet is a de’Oraita transgression!

Second, and more importantly, usually doing *melacha* in a way that is out of the ordinary is considered a de’Rabanan transgression!

The Eglei Tal explains that cooking is the process of having the heat affect the food. He says that there is a difference between the quality of the fire’s heat being instilled in the food, and the quality of the sun’s heat affecting it.

Therefore, we aren’t achieving the same result with different means. We are achieving a different result.

The Meiri’s explanation sounds similar:

Cooking is instilling the quality of the fire’s heat into the food, not the quality of the sun’s heat.

This connects to broader discussion regarding the concept of ב‧‧. This term is used in two different contexts: 1. Doing an action in an unusual way (turning the light switch on with one’s elbow). 2. Doing the action in a way that creates a different result (writing with the weaker arm – the words will be written, but not as clearly as would have been with the other hand), as the Eglei Tal explains:
In many Torah contexts, the second kind applies, and the first doesn’t. In most Mitzvot, only a difference in outcome is relevant. If meat and milk are cooked together using a person’s weaker arm, that is still a full Torah transgression. The laws of Shabbat are based on how the Mishkan was built. This creates another rationale for differentiation between doing the melacha in its usual way and otherwise. Whereas the regular Torah rules would not distinguish between doing things normally or otherwise, as long as the outcome is the same, when it comes to Shabbat any change suffices to classify it as “not the way it was done in the Mishkan”, even if the outcome is identical.

Our assumption was that the sun is simply another heat source that is not normally used for cooking, but the outcome is identical. That would be a change of the second kind, which would be Rabanically prohibited. Therefore the Eglei Tal says that we must be dealing with a change of the first kind. The outcome of cooking in the sun must be different from the regular cooking.

(Compare this with the many other Mitzvot which are derived from the mishneh be’Eirah of the Mishkan. In this case, the outcome is identical, because the mishneh be’Eirah exists in the Mishkan for all of these melachot. This is the source of the derivation of their melachot. But when they are done in the sun, the outcome is different, and the mishneh be’Eirah does not exist in the Mishkan. Therefore the Eglei Tal derives that there is a change of the first kind.)

Rav Feinstein explains that cooking in the sun is not a melacha de’Oraita. He does not mention a difference in outcome, nor the method used in the Mishkan. According to the Eglei Tal, cooking in the sun will achieve a different outcome. There may be a Nafka Mina between these explanations, as they apply to other Isurim. We elaborate on this point in the הרחבות.
Rav Shaul Israeli took a more essentialist angle:

עמדת הרפיני סמח כאות

אעיק חוכ הוא החמה בתן מים בתלוש, ומכ שמועלーム היא על ידי חמשה בלוש, אкий בואב כתיי יי תלום שתחי

זה חמיקת המוחמה או החימדיאי דריי בישה, ויורח תרא לי חמשה המוחמות של דריי רשיי שיאי דריי

ביושל בכי, חiami שיאו החמה יאני מיתיי מעניק בראות בלוש.

Rav Israeli explains that people’s choice not to cook with the sun isn’t coincidental. The sun was created in order to warm and light up the world. Also after science has contrived ways of utilizing the solar power for other purposes, cooking with the sun will never be considered using it for its original purpose.

If cooking with sunrays becomes prevalent, would that change the Halakha? According to Rav Feinstein, presumably it could change the Halakhic view on cooking with the sun. According to Rav Israeli that would make no difference, as he explicitly says about the solar heated water systems:

אפיי שבודאי מסתבר גם אם ימציאו המצאה טכנית לנצל את כוח השמש בלוש ומוחלט, כי הוא י디יד דריי

כימי, נכי לא אגי מגלד היה ציאי בישה בוחנהライトו, וראי דריי הוא דריי. כי עיקרו התוף אניי מידוע

בללווש, חנוי שמשולוס אנהי על ידי חמשה בלוש, אקיי בואב לכלי יי תלום שיאי יי חמיקת המוחמות

הוחמדיא דריי בישה בכי.

How does this affect electric heat?

לכיושר ומעון חום שיאי בישה וחולם דניו מלשה דרבני, חיים שמשולוס צומס יאני ויאי... אפיי במא יבישה יאן

זה אלמי חלוד המוח, אפיי גוי שמשו בישהalsa מיתו... (אף מיסייד היי באכיי - יבישה בוחנה השמש,

שדרי יבישול טובר, והלה גי שלי שש אוי רורי, אפיי לבר מום שיאי על ידי דריי בישה מודי שיאי דר דר

As opposed to the sun, which has its purpose and efficacy, electric heat is effective and was harnessed for generating heat from the outset. It is therefore no different from fire.

In summary:

From the Gemara (Shabbat 38b) we learn that cooking with fire and its derivatives is an Isur de’Oraita. Cooking with sun rays is allowed on Shabbat. And cooking with the derivatives of the sun rays is a Makhloket. All agree that there is no Isur de’Oraita, the makhloket is whether there is a gezera prohibiting cooking with derivatives of the sun. Rambam and Shulchan Aruch say that cooking in such a way is prohibited.

Why is cooking in the sun any different from cooking in other unusual ways?

1. It was not done in the Mishkan (Mabit, Tzlach). As we pointed out, this point would not sufficiently explain why it is allowed. Normally such distinctions remain asur Mi’Derabanan.

2. Cooking in the sun’s rays provides a different outcome from cooking in the sun (Eglei Tal).

3. Cooking in the sun is not considered a normal method. This is the explanation Rav Feinstein provides. Rav Israeli takes a further step – the sun was not created for the purpose of cooking.

Even if science harnesses its power for cooking, it still doesn’t change its original essence (as we will see, Rav Feinstein probably disagrees with that last point).

This affects his view on the solar water heating system – even if all people will use the sun’s rays to heat up their water, that will not change the sun’s essence. As to electrically generated heat – electricity was used to generate heat and cook from the outset, and therefore is no different from fire.

Microwave ovens

Is cooking with a microwave oven on Shabbat Asur mi’de’Oraita or Mi’de’Rabanan?

2 Obviously this view raises a tremendous theological question – how are we to determine the purposes for which things have been created?
Unit 23 – Varying sources of heat

(For the purpose of this discussion, we are ignoring the aspect of use of electricity on Shabbat, and focusing strictly on the question of the cooking of the microwave).

First: how does the microwave heat the food?

Microwaves are produced inside the oven by an electron tube called a magnetron. The microwaves are reflected within the metal interior of the oven where they are absorbed by food. Microwaves cause water molecules in food to vibrate, producing heat that cooks the food (from the FDA website).

Let’s analyze this method based on the previous definitions:

There is no question that there was no microwave use in the Mishkan. As we said, this is not necessarily sufficient to render it allowed, but presumably would mean that at most, it can be considered an Isur de’Rabanan.

As to the difference in method and outcome, it seems that the difference is far greater than the difference between using the sun and fire. The microwaves enter the food and affect the liquids within. These are already two differences. If the Eglei Tal differentiates between the sunrays and fire heat waves, microwaves are surely a third category. Besides, the warming method is totally different. As opposed to the fire and sun, which project heat, microwaves enter the food and cause vibrations. Additionally, the outcome, the resulting warmed food, is far more different from the difference between the fire and the sun affecting the food:

Rav Israeli’s distinction between that which was created for the purpose of cooking and that which has not would have to decide whether to assume that microwaves were created for this purpose.

Rav Feinstein says:

Rav Feinstein says that use of microwaves is not yet prevalent. Once it is, and proves to be as effective as any other heat source, it would become an Isur de’Oraita.

On the one hand, microwave ovens are commonplace household appliances. On the other hand, we have more experience of microwave oven use, and know that heating with a microwave oven is very different from heating with a regular oven. The quality of heating in a microwave is significantly inferior to the quality of heating in a regular oven (the reason for this is due to the way the food heats up. The microwave causes vibrations in the liquids, so the liquids heat up first, and bring heat to the food that it is in. For many foods, this is not a good way of warming or cooking).

Chemical reaction cooking - Flameless ration heater

Another food heating method is based on a chemical reaction, as explained by https://www.howstuffworks.com/:

Because of the importance of a hot meal, all military MREs come packaged with a flameless heater. The flameless heater uses a simple chemical reaction to provide sufficient heat to warm the food.


Questions and comments may be sent to: info@eretzheimdah.org
The idea behind a flameless heater is to use the oxidation of a metal to generate heat. Magnesium metal works better than iron because it rusts much more quickly. To make a flameless heater, magnesium dust is mixed with salt and a little iron dust in a thin, flexible pad about the size of a playing card. To activate the heater, a soldier adds a little water. Within seconds the flameless heater reaches the boiling point and is bubbling and steaming. To heat the meal, the soldier simply inserts the heater and the MRE pouch back in the box that the pouch came in. Ten minutes later, dinner is served!

In summary

The difference between cooking in the sun and cooking with fire

From the Gemara (Shabbat 38b) we learn that cooking with fire and its derivatives is an Isur de'Oraita. Cooking with sun rays is allowed on Shabbat. And cooking with the derivatives of the sun rays is a Makhloket. All agree that there is no Isur de'Oraita, the makhloket is whether there is a gezera prohibiting cooking with derivatives of the sun. Rambam and Shulchan Aruch say that cooking in such a way is prohibited.

Why is cooking in the sun any different from cooking in other unusual ways?

1. It was not done in the Mishkan (Mabit, Tzlach). As we pointed out, this point would not sufficiently explain why it is allowed. Normally such distinctions remain asur Mi'Derabanan.

2. Cooking in the sun's rays provides a different outcome from cooking in the sun (Eglei Tal).

In the responsa of the bahri, the responsum discusses whether it would be considered a form of cooking that is prohibited on Shabbat, based on the criteria we learned:

In summary

The difference between cooking in the sun and cooking with fire

From the Gemara (Shabbat 38b) we learn that cooking with fire and its derivatives is an Isur de'Oraita. Cooking with sun rays is allowed on Shabbat. And cooking with the derivatives of the sun rays is a Makhloket. All agree that there is no Isur de'Oraita, the makhloket is whether there is a gezera prohibiting cooking with derivatives of the sun. Rambam and Shulchan Aruch say that cooking in such a way is prohibited.

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https://science.howstuffworks.com/mre4.htm
3. Cooking in the sun is not considered a normal method. This is the explanation Rav Feinstein provides. Rav Israeli takes a further step – the sun was not created for the purpose of cooking. Even if science harnesses its power for cooking, it still doesn't change its original essence (as we will see, Rav Feinstein probably disagrees with that last point).

This affects his view on the solar water heating system – even if all people will use the sun's rays to heat up their water, that will not change the sun's essence. As to electrically generated heat – electricity was used to generate heat and cook from the outset, and therefore is no different from fire.

**Application to microwave ovens**

According to the Mabit and Nodah be'Yehuda: microwaves were not used in the Mishkan. Therefore, their use should not be prohibited on Shabbat.

According to the Eglei Tal: microwaves definitely affect food differently from fire (far more different than the difference between the fire and the sun!). Cooking with a microwave should be permissible based on this.

Rav Feinstein says that once use of microwave ovens is not yet prominent enough, but once its use becomes prominent, it will become prohibited. Though it seems that now that we know that the quality of microwave cooking falls significantly short of oven cooking, it seems he too would agree that there would be no prohibition.

Rav Israeli leaves us in a difficult position. Since we cannot assess the reason Hashem created the microwaves, for cooking or other use, we cannot know if cooking with it on Shabbat is prohibited or not.

**Use of the solar water heating system on Shabbat**

1. Is the system cooking with the sun or its derivative?

Rav Waldenberg explains that the system traps and uses the sun's heat more effectively, but ultimately only the sun's heat is heating the water, and is therefore allowed.

2. Causing cold water to mix into the warmed water

The Poskim raised two reasons for leniency:

3. Is the *gezera* applicable in this case?

   The Maharshad says that in cases in which the use of the sun is discernible, the *gezera* does not apply. The Magen Avraham disagrees, and so the Minhat Yitzhak says that we should be stringent. Rav Kapach explains that in this case the Magen Avraham would be lenient as well, since the system deos not work in the sun's absence.

   GRSZ Aurbach raised the opposite reason for stringency: turning the hot tap on looks no different, regardless of the heating system being used. Therefore, we should be doubly cautious and not allow use of water heated by the sun (we pointed out that this is a new *gezera*, but should be cautionary).

4. Psik Reisha de'Rabanan that does not benefit the perpetrator:

   Heating up cold water with the water in the tank is a de'Rabanan prohibition, since that water was warmed by the sun. The act of warming the new water is unintentional (albeit inadvertent), and does not benefit the perpetrator, and is therefore allowed.

With this we have completed the laws of cooking on Shabbat. Next we will study Chazal's *gezera* prohibiting leaving food on the flame as Shabbat begins.