

# The 2021 Talmudology Passover Reader



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# The Chemistry of Chametz

The Talmud in tractate *Pesachim* discusses the chemistry of *chametz*:

פסחים לה, א

לא (דברים טז, ג) אמר ריש לקיש וכן תנא דבי ר' ישמעאל וכן תנא דבי ר' אליעזר בן יעקב אמר קרא תאכל עליו חמץ שבעת ימים תאכל עליו מצות לחם עוני דברים הבאים לידי חימוץ אדם יוצא בהן ידי חובתו בפסח יצאו אלו שאין באין לידי חימוץ אלא לידי סירחון

*How do we know that matzah must be made from one of five species of grain [wheat, barley, oats spelt and rye]? Reish Lakish said, and likewise a Sage of the school of Rabbi Yishmael taught, and likewise a Sage of the school of Rabbi Eliezer ben Ya'akov taught, that the verse states: "You shall eat no leavened bread with it; seven days you shall eat with it matzah, the bread of affliction" (Deuteronomy 16:3). This verse indicates that only with regard to substances that will come to a state of leavening does a person fulfill his obligation to eat matzah by eating them on Passover, provided that he prevents them from becoming leavened. This serves to exclude these foods, i.e., rice, millet, and similar grains, which, even if flour is prepared from them and water is added to their flour, do not come to a state of leavening but to a state of decay [sirchon].*

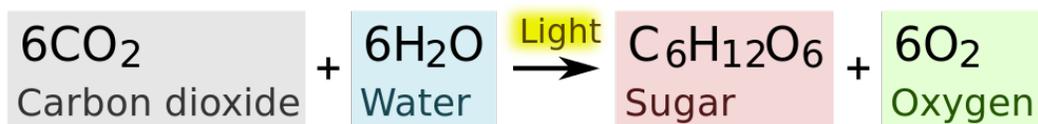


The important question we will answer here is whether there is something *fundamentally different* about rice when compared to the five grain species that can

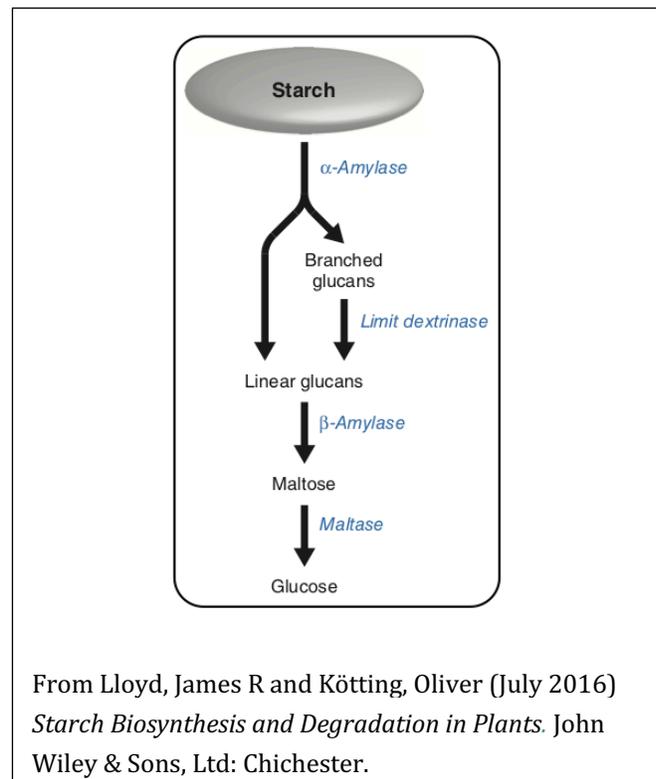
become chametz. And is there any scientific support to the claim that rice spoils sooner than it ferments?

## THE CHEMISTRY OF BREAD MAKING

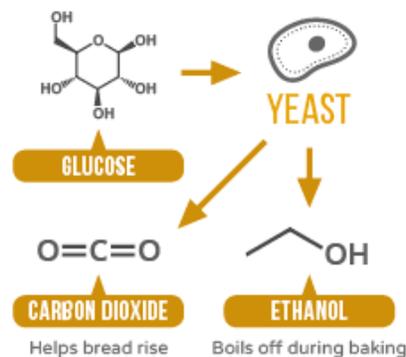
To get at the answers we need to remind ourselves how plants make and consume starch. They take carbon dioxide from the atmosphere and water from the soil, and using the energy contained in sunlight (and the magic of chlorophyll) convert the two into a large sugar molecule we call starch. Plants use this starch to store and provide them with energy.



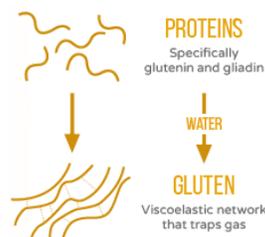
If you grind up wheat (or many other species of grain) you make flour which contains loads of starch. In addition to starch, flour contains proteins and enzymes which become important when the flour is mixed with water. Without going down a rabbit-hole of detail, here in general is what happens. First, an enzyme called *beta-amylase* breaks the large starch molecule down into a smaller molecule called *maltose* which is made up of two molecules of glucose. Another enzyme, *maltase*, breaks down each molecule of maltose into two molecules of glucose which is then broken down further to provide the plant with energy.



If you add some yeast into that mix, a chemical reaction called fermentation occurs. Yeast, which is a fungus, consumes glucose and turns it into carbon dioxide and ethanol, which is an alcohol.



As the flour and water and yeast all mix together, two proteins in the flour called gliadin and glutenin (which are *glutens*) give the dough mixture its characteristic body, which strengthens the more it is mixed. The dough traps the carbon dioxide that is given off by the yeast cells, which causes the bread to rise. And that gives us the leavened bread we call *chametz*.



Of course when matzah is made, we do not add yeast to the dough. But there are yeast particles in the air and these will inevitably land on the dough where they will act in the same way, consuming glucose and creating carbon dioxide and alcohol. This process is much slower than when yeast is added when bread is made, but the plain dough will rise a little as a result.

## THE DIFFERENCES BETWEEN GRAINS AND RICE

Resh Lakish, together with those sages of the schools of Rabbi Yishmael and Rabbi Eliezer ben Ya'akov claimed that unlike grains, rice does not ferment when water

is added to it. Instead it spoils. That's why it may be eaten on Passover (unless of course you are an Ashkenazi Jew, in which case you still can't eat it, but for another reason we're not going to get into). Is this in fact the case?

Dr Angus Murphy is Professor and Chair of the Department of Plant Science at the University of Maryland and wrote *the* textbook on plant physiology. Dr. Murphy was kind enough to have a long chat with Talmudology over the phone and he agreed with the suggestion that grains and rice do very different things when mixed with water. The wheat seed is surrounded by the endosperm, which is itself covered by the aleurone layer. This aleurone is rich in amylase which as you recall is needed to breakdown starch into glucose (which is eaten by yeast which releases carbon dioxide and alcohol which causes the dough to rise...) However (most species of) rice do not contain this aleurone layer. So they have very little amylase, which means that it takes them a much longer time to convert starch into glucose. In fact, it takes so long that by the time there is enough yeast in the dough for it to start to rise, bacteria in the air will have colonized the mixture and started breaking down the proteins in the dough. And that protein breakdown is what makes the mixture spoil, and which is what the Talmud calls סירחון.

To conclude, Professor Murphy thought that the Talmud's description of the difference between grain and rice was firmly based in plant biology.

#### **THE FINE PRINT AND THE FINAL VERDICT**

Of course things are a little more complicated than that. (They always are.) Different kinds of wheat flour contain different amounts of amylase. Fine bleached white flour contains less amylase than say whole wheat flour, because the aleurone layer in whole wheat flour has not been broken down. Similarly, different species of rice contain different amounts of amylase, so that while standard white rice has very little, brown rice has considerably more. During talmudic times, the wheat flour would have been far less processed than any of the flour we would use today.

As a result it would contain more amylase, and would have risen faster than would today's supermarket flour.

Variety of rice	$\alpha$ -Amylase	Total $\beta$ -amylase	Active $\beta$ -amylase
Takanenishiki	—	12.2	1.7
Yamadanishiki	—	13.8	3.0
Gohyakumangoku	—	11.4	3.3
Sasanishiki	—	12.6	2.1
Fujiminori	—	12.2	1.5
Kinmaze	—	14.8	2.3
Nihonbare	—	12.4	1.9
Honenwase	—	12.8	2.0
Fukunohana	—	13.2	2.6
Yamahoshi	—	13.2	3.6
Akebono	—	13.4	2.5
Kinki-33	—	16.4	1.9
Yoneshiro	—	13.4	2.2
Shiokari	—	11.0	1.4
Shinsenbon	—	11.2	2.6

Distribution of various types of amylases in rice grains. (Beta-Amylase activity was expressed in terms of maltose mg liberated in 3 min at 30°C by 1 g of ground rice samples.) From Ryu Shinke, Hiroshi Nishira & Narataro Mugibayashi. Types of Amylases in Rice Grains. *Agricultural and Biological Chemistry* 1973; 37:10, 2437-2438

But as a rule of thumb, the Talmud is, biochemically speaking, spot on. When mixed with water, the five species of grain from which matzah may be made do undergo fermentation even without the addition of yeast, while rice will spoil long before the fermentation process becomes noticeable.

~

# Blood to Prevent Plague

The Mishnah outlines some of the differences between the very first Passover that was celebrated while the Jews were still in Egypt, and the Passovers that were celebrated in the Temple in Jerusalem in the centuries that followed.

פסחים צו, א

*מתני' מה בין פסח מצרים לפסח דורות? פסח מצרים מקחו מבעשור, וטעון הנאה באגודת ארוב, ועל המשקוף ועל שתי המזוזות, ונאכל בחפזון, בלילה אחד. ופסח דורות נוהג כל שבועה*

*MISHNA: What are the differences between the Paschal lamb that the Jewish people offered in Egypt and the Paschal lamb offered in all later generations? The Paschal lamb the Jewish people offered in Egypt had to be taken from the tenth of the month of Nisan and required the people to sprinkle its blood with a bundle of hyssop, unlike the Paschal lamb in all later years, and its blood was also sprinkled upon the lintel and the two doorposts, and it was eaten with haste; in addition, the Paschal lamb in Egypt was only on one night, whereas the Paschal lamb throughout the generations is observed for seven days.*



The Talmud spends several pages discussing the differences between that first Passover and all those that came later. As a rule, we don't do much sprinkling of blood on our doorposts these days, but that was not always the case. Since we are still in the throes of a pandemic, let's take a look at an overlooked custom that arose in Turkey during a pandemic there, and how it was connected to this *Mishnah*.

## THE BLOODY QUESTION

Rabbi Chaim Palagi (1788-1868) was an important rabbi and leader of the Jewish community in Izmir (Smyrna), Turkey, and his influence was felt far beyond.

Among his many books (somewhere between seventy and eighty!) is a collection of responsa called *Chaim Beyad* (חיים ביד), in which he was asked the following question:

*Come and listen and I will tell you about whether the custom to write God's name [שם הוי"ה ביה] with the blood from a circumcision is appropriate. And if it is argued that it is indeed permitted, because it provides protection during an epidemic (heaven forbid), whether it is permitted to write God's name in red or in any color other than in black ink...*

So apparently the Jews of Izmir used to take the blood from a Jewish baby that had just been circumcised paint God's ineffable name with it onto a flag or poster and presumably hang it somewhere for protection against a pandemic. (I know what you are thinking: why on earth was there so much blood? What exactly were they doing wrong? Fair questions, but let's stay focused.) This practice had its roots in that very first Passover, where the blood of a lamb painted on a doorpost signaled that there would be no death in the house, for it was under God's protection.

Rabbi Palagi's answer is technical and difficult to follow, but in the end he seems to allow the practice if the scribe is "a person of great learning and an expert in Kabbalah and there is a great need." Moderns would, I am sure, find the whole practice quite distasteful, but it reminds us that when things are desperate and there aren't a lot of options, prayer and folk magic are invoked in the face of a pandemic. Today there is no need to adopt this practice. We have a vaccine.

~

# The Passover Seder and the Heimlich Maneuver

In describing the regulations for the proper performance of the Passover Seder, the Talmud concludes that the celebrant must recline while drinking each of the Four Cups of wine. Then comes this discussion of how, exactly, one reclines:

פסחים קח, א  
פְּרָקְדָן לֹא שְׁמִייה הִסִּיבָה. הִסִּיבַת יְמִין לֹא שְׁמִיה הִסִּיבָה. וְלֹא עוֹד, אֲלֵא שְׁמֵא יְקָדִים קָנָה לְנוֹשֵׁט, וְיָבֵא לִידֵי סָקָה

*Lying on one's back is not called reclining. Reclining to the right is not called reclining [as free people do not recline in this manner. People prefer to recline on their left and use their right hand to eat, whereas they find it more difficult to eat the other way]. And not only that, perhaps the windpipe will precede the esophagus. [The food will enter the windpipe, and one will come into danger of choking]*

Rashi, the great medieval commentator explains that the last comment “perhaps the windpipe will precede the esophagus” refers to lying flat on one's back:

רש"י פסחים קח, א  
שמא יקדים - אפרקדן קאי שמתוך שצוארו שוחה לאחריו שיפוי כובע הסותם את פי הקנה נפתח ומתקפל למעלה והקנה פושט למעלה והמאכל נכנס לתוכו ונחנק

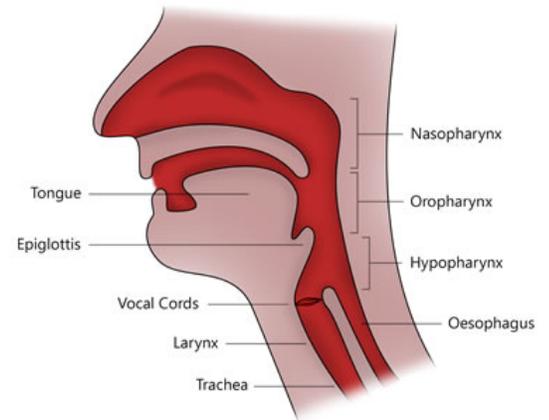
*This refers to lying on the back. For then the neck is stretched backwards, and the covering that blocks the trachea is open and the trachea is thrust upwards. Food can enter and cause choking.*

However, Rashi had a prodigious grandson called Shmuel, who also wrote a commentary on this passage. Rabbi Shmuel ben Meir (c.1085-1158) or Rashbam, as he is known, disagreed with the explanation of his grandfather, and offered this instead:

רשבים פסחים קח,א

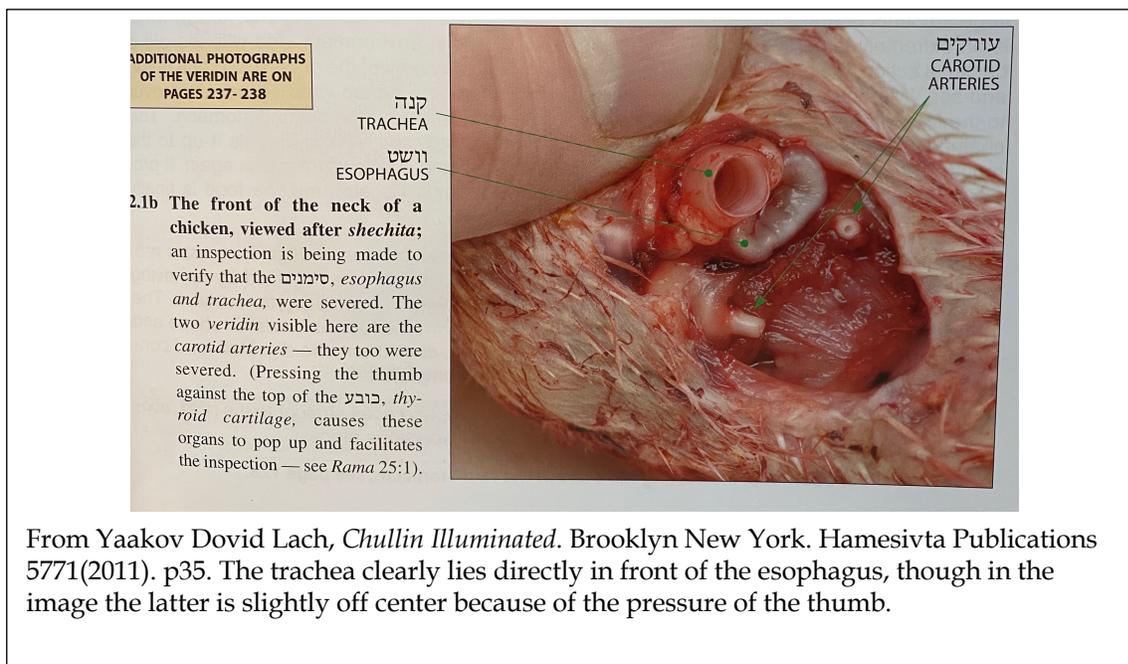
שמא יקדים - ... וקשיא לי אמאי לא סמכיה להאי ולא אהסיבת ימין ורבותי פירשו שמא יקדים קנה לושט דושט הוי על (דרך) ימין ונפתח הכובע שעל פי הקנה מאיליו כשהוא מטה כלפי ימין ואם יכנס בו המאכל הרי סכנה שאין אוכלין ומשקין נכנסין אלא דרך הושט ולכך נראה בעיני דאהסיבת ימין קאי מדסמכיה לדידיה

*Rashi's explanation is difficult to understand. Why did he not explain that [the danger] is when you lean to the right [while drinking]? My teachers explained that "perhaps the windpipe will precede the esophagus" refers to leaning, because **the esophagus is on the right side**. The covering that covers the trachea will open when he leans to the right, and if food gets into the trachea there is a danger [of choking], because food and drink should usually only be found in the esophagus. This is why I believe the Talmud is referring to the [danger of] leaning to the right...*



## THE RASHBAM'S ANATOMY IS INCORRECT

The anatomy described by the Rashbam is wrong. The trachea lies directly in front of the esophagus; one is not to the right of the other. If you reach up and put your fingers around your trachea now (go on, do it) you will *not* feel the esophagus because it is lying behind the trachea (and because it is essentially a long fleshy tube with no internal rings for support). This is true in us, and it is true in animals like cows, sheep and chickens, which are kosher and which, presumably, the Rashbam could have used as a model to figure this out. Had he taken a look at freshly slaughtered chicken, he would have seen this.



## WHAT HAPPENS WHEN WE SWALLOW?

The Rashbam did not have access to YouTube, which is a shame, because there are many great videos that explain the process. The epiglottis acts as a trapdoor, closing off the entrance to the trachea each and every time you swallow. Of course when you talk and try to swallow your food, you are forcing air down into the into your larynx while at the same time hoping that no food gets in. When it does, you will cough at best, and choke at worst. Which is why we were always taught never to talk with our mouths full. It's good advice.

When you choke, a piece of food is stuck around the epiglottis or top of the trachea. This stimulates our coughing reflex, in an attempt to use the force of air to dislodge the food and expel it up and out. If food gets past this sensitive area and enters the lungs, there is no more choking. It is too late for that.

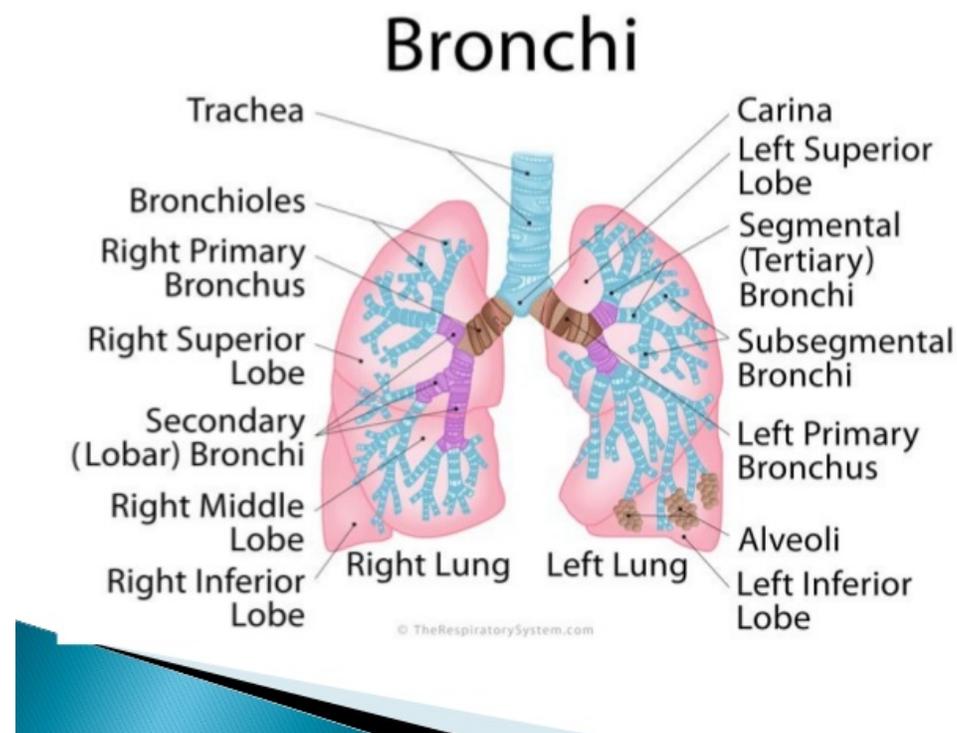
But does leaning to one side or another increase the likelihood of choking on food? Not at all. First, because if you listen to your mother's advice and don't try and talk while swallowing, you won't choke. And second, because the trachea, the esophagus and the epiglottis are all midline structures. Leaning to one side makes you no more or less likely to choke than does leaning to the other.

## BUT WHAT ABOUT THE RIGHT MAIN BRONCHUS?

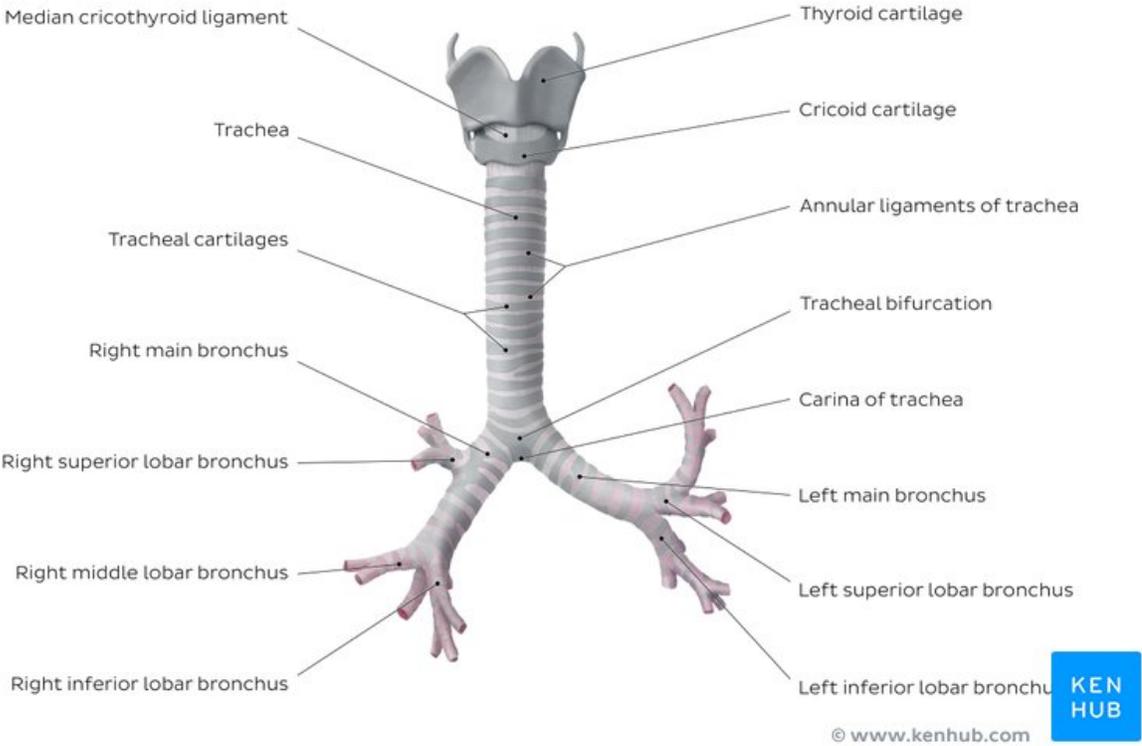
The Steinsaltz (Koren) English Talmud has a nice diagram of the upper trachea and esophagus, but unfortunately it fails to label the all important epiglottis, and nor does it address the issue of the mistaken anatomy of the Rashbam. The Schottenstein (ArtScroll) English Talmud goes into a little more detail. It notes that “actually the esophagus is directly behind the windpipe...which makes it unclear what Rashbam means when he writes that the esophagus is ‘on the right side.’” So far, so good. But then comes this:

*There are, though, anatomical differences between the left side and the right side (e.g the right bronchus branches off the windpipe into the right lung at a far more gradual angle than the left one does into the left lung) that might account for why leaning on the right side presents a choking hazard whereas leaning on the left side does not.*

Here is what the ArtScroll explanation is getting at:



As you can see, the trachea ends at a sort of T-junction with the right and left main bronchi. And if you pay attention to the diagram, you will see that the right main bronchus comes off at a more gentle angle than does the left. Here is another diagram, this time just of the trachea and bronchi, where you can see this a little more clearly:



Do you see how, when compared to the left, that right main bronchus comes off at a more gentle angle? Now, if you were a piece of bread, or better yet, a piece of matzah that had snuck past the epiglottis and you were making your way down into the lungs, which direction would you be more likely to go, *all things being equal*, when you reached that junction with the right and left main bronchi? You would be more likely to continue in a straight line, rather than take a sharp left turn. And so you would be more likely to end up in the right main bronchus. Which is exactly what happens when people aspirate food into their lungs: it generally ends up in the right lung rather than the left. And, by the way you now

know the answer to a common question thrown at medical students on the first day of their pulmonary rotations.

But what does this have to do with leaning to the *right*, as noted in the ArtScroll commentary? In a word, nothing. In two words, absolutely nothing. Leaning to one side or another might theoretically change the side into which the food might lodge if you are unlucky enough to aspirate it, but food in the right lung is as undesirable as food aspirated on the left. Neither is good for you, and if left untreated will lead to aspiration pneumonia and its complications, none of which are good.

### **WHAT ABOUT A LEFT-HANDED PERSON?**

When the Talmud addresses issues to do with sides, it assumes that the person is right-handed, since this is true of the majority. But there are differences for left-handed people. For example, a left-handed person puts tefillin on the *right* arm, while right-handers do so on the left. Might there be a difference for left-handers when it comes to this business of leaning on the Seder night?

Rabbi David ben Solomon ibn Zimra (1479-1573, known by his acronym *Radbaz*, was one of the leading rabbinic leaders of his generation. In one of his three thousand (!) responsa he addressed the question of whether a person who is left-handed should recline on his right side. In his answer he wrote that he too failed to understand the anatomy described by the Rashbam.

תשובות רדב"ז ג: 1012  
ועוד ראיתי כי הסימנים שוכבין זה על זה ולא ידעתי אם סימני אדם נשתנה

*Furthermore, I have seen that the trachea and the esophagus lie one behind the other (although I do not know if this is the same as in people)*

Radvaz wrote that for a left-handed person, leaning to the *left* would be uncomfortable, and since the entire point of the act of leaning is to replicate a feeling of freedom, for a left-handed person this cannot be the correct thing to do:

ועוד הרי תקינו הסיבה זכר לחירות ואם הוא מסב על ימינו ואוכל בשמאלו מצטער הוא ואין זה דרך חירות  
Therefore, he concluded that a left-handed person should lean rightwards, though not because of anything to do with a danger of choking, which, as we have seen, does not depend on leaning one way or the other.

## **HOW TO SAVE A CHOKING PERSON**

According to the National Safety Council, about 5,000 people die in the US each year from choking. About half are over 74, and food is often responsible. This is why each of us should know how to perform *abdominal thrusts*, also known as the Heimlich maneuver:

1. Stand behind the person. Place one foot slightly in front of the other for balance. Wrap your arms around the waist. Tip the person forward slightly. If a child is choking, kneel down behind the child.
2. Make a fist with one hand. Position it slightly above the person's navel.
3. Grasp the fist with the other hand. Press hard into the abdomen with a quick, upward thrust – as if trying to lift the person up.
4. Perform between six and 10 abdominal thrusts until the blockage is dislodged.

So go ahead and learn these steps. Who knows? You might save a life on Seder night.



# The Square Root of Two and the Danger of Pairs

The Mishnah ruled that a person must drink four cups of wine on the night of the Passover Seder. But this may pose a problem:

פסחים קט, ב

לא יפָקְחוּ לוֹ מֵאַרְבָּעָה. הֵיכִי מְתַקְנֵי רַבָּנָן מִיַּדֵּי דְאֵתֵי בֵּה לִידֵי סַבְנָה, וְהִתְנַיָּא: לֹא יֵאָכֵל אָדָם תְּרֵי, וְלֹא יִשְׁתֶּה תְּרֵי, וְלֹא יִקְנַח תְּרֵי, וְלֹא יַעֲשֶׂה צְרָכָיו תְּרֵי

*But wasn't it taught in a baraita: A person should not eat pairs, i.e., an even number of food items; and he should not drink pairs of cups; and he should not wipe himself with pairs; and he should not attend to his sexual needs in pairs.*

The rabbis were concerned that doing things in pairs exposes a person to sorcery or demons. Why then would the Mishnah require that an even number of cups be drunk? That would place a person in great danger! Rabbi Nachman provides some reassurance. No harm will come because the night of the Passover Seder is a special night.

פסחים קט, ב

אָמַר רַב נַחֲמָן, אָמַר קְרָא: "לַיִל שְׁמוּרִים" — לַיִל הַמְּשׁוּמָר וּבָא מִן הַמַּיִקוּן

*Rav Nachman said that the verse said: "It was a night of watching to the Lord" (Exodus 12:42), which indicates that **Passover night is a night that remains guarded** from demons and harmful spirits of all kinds. [Therefore, there is no cause for concern about this form of danger on this particular night.]*

Additional, or perhaps alternative reasons for reassurance are provided by the great Babylonian sage Rava (c.280-352), and several generations later by Ravina:

רָבָא אָמַר: כּוֹס שֶׁל בְּרַכָּה מִצְטַרֵּף לְטוֹבָה, וְאֵינוֹ מִצְטַרֵּף לְרַעָה. רַבִּינָא אָמַר: אַרְבַּעָה כּוֹסֵי תְּקִינּוּ רַבָּנִין דְּרַדְּךָ תִּירוּת, כֹּל טַד וְטַד מִצְנָה בְּאַפֵּי נַפְשָׁה הוּא

*Rava said: The cup of blessing for Grace after Meals on Passover night is used in the performance of an additional mitzva and is not simply an expression of freedom. Therefore, it combines with the other cups for the good, i.e., to fulfill the mitzva to drink four cups, and it does not combine for the bad. [With regard to the danger of drinking pairs of cups, it is as though one drinks only three cups.]*

*Ravina said: The Sages instituted four separate cups, each of which is consumed in a manner that demonstrates freedom. Therefore, each and every one is a distinct mitzva in its own right. [In other words, each cup is treated separately and one is not considered to be drinking in pairs.]*

## THE DANGER OF PAIRS

The Talmud spends several pages (*Pesachim* 109-111) explaining some of the issues around pairs.

פסחים קי, א

תְּנִי רַבָּנִין: שׁוֹתֵה כְּפָלִים — דָּמוֹ בְּרֵאשׁוֹ. אָמַר רַב יְהוּדָה: אֵימְתִי — בְּנִמּוֹן שְׁלֵא רָאָה פְּנֵי הַשּׁוּק, אֲבָל רָאָה פְּנֵי הַשּׁוּק — הִרְשׁוּת בְּיָדוֹ. אָמַר רַב אֲשִׁי: תּוֹנִיָּא לִיהַ לְרַב תּוֹנִיָּא בַר בֵּיבֵי, דְּאַפֵּל כְּסָא תְּנִה נַפְיָק וְתוֹי אַפֵּי שׁוּקָא .

*The Sages taught in another baraita: If one drinks in pairs his blood is upon his head [i.e., he bears responsibility for his own demise].*

*Rav Yehuda said: When is that the case? When one did not leave the house and view the market place between cups. However, if he saw the marketplace after the first cup, he has permission to drink another cup without concern.*

*Likewise, Rav Ashi said: I saw Rav Chananya bar Beivai follow this policy: Upon drinking each cup, he would leave the house and view the marketplace.*

The great Babylonian sage Abaye (d~337 CE.) was raised never to drink precisely two cups.

ואבני, פי שתי חד פסא, מנקיט ליה אימיה תרי קסי בתרי ידיה

*When Abaye would drink one cup, his mother would immediately place two cups in his two hands so that he would not inadvertently drink only one more cup and thereby expose himself to the danger of drinking in pairs.*

Rav Nachman, who was a contemporary of Abaye, apparently had a personal butler, and followed a similar practice:

ורב נחמן בר יצחק, פי הנה שתי תרי קסי, מנקיט ליה שמעיה חד פסא, חד פסא — מנקיט ליה תרי קסי בתרי ידיה

*And similarly, when Rav Nachman bar Yitzchak would drink two cups, his attendant would immediately place one more cup in his hand, and if he would drink one cup, the attendant would place two cups in his two hands. These reports indicate that one should be concerned for his safety after drinking an even number of cups, even when he remains at home.*

### **ISAAC BAER LEVINSOHN ON THE ORIGINS OF THE SUSPICION**

Isaac Baer Levinsohn (1788-1860) was a Ukrainian Hebrew scholar and leader of the Haskalah. In a collection of his essays and letters called *Yalkut Rival* published in Warsaw in 1878 he addressed the origin of the Talmudic concern about pairs of things. Here it is:

*The Babylonian Talmud, Chapter Arve Pesachim, (109–110), expounds at length on the matter of concern about zugot, even numbered events...*

*In early general literature, I found that both the Greek philosopher Pythagoras and his student Plato were most particular about the number two. They believed that it indicates very bad omen. During the era of Pythagoras, this belief was prevalent over the entire Italian region. The Romans also believed in the terrible powers of the number two. Since they customarily consecrated all evil things to the god Pluto, we find in mythological books of the early Romans that the second month of the year and the second day of that month were consecrated to this god...*

*Our Sages (who generally sought scriptural hints at established customs) noted [in Gen. Rab. 4:7] that the second of the six days of creation is the only one in which ki tov, “that it is good” [Gen 1:6–8], is not written. We also treat the fourth day of the week like the second day, and do not begin projects on it...*

*However, it is distinctly possible that the number four is considered to not be good because of zugot, as it is a double pair. Tractate Pesachim of the Babylonian Talmud [112b] also states that on the eve of the fourth day [= Tuesday night] Agrat bat Machlat ventures out (see my Bet Yehudah for speculation as to the original identity of Agrat, the qelipah “shell”). Finally, to defuse these primitive beliefs from the hearts of the masses, our sages maintained elsewhere that Monday and Wednesday are, in fact, excellent days to begin projects, with a mnemonic: Ba”D qodesh, “holy Monday and Wednesday,” literally “holy fabric.”*



## THE FEAR OF $\sqrt{2}$

It is not clear to which writings attributed to Pythagoras Levinsohn was referring, but it may be connected to the Pythagorean discovery (if it was indeed discovered by him) that the square root of two is an irrational number. In his sweeping history of mathematics, *The Universal History of Numbers: From Prehistory to the Invention of the Computer* (p.596) Georges Ifrah wrote that the discovery that  $\sqrt{2}$  is irrational (meaning it goes on and on forever without a repeating pattern, like  $\pi$ ) “greatly perturbed the Pythagoreans, who believed that number ruled the Universe...”

*The new numbers were called “unmentionable” and the existence of these monsters was not to be divulged to the profane. According to the Pythagorean conception of the world, this inexplicable error on the part of the Supreme Architect must be kept secret, lest one incur divine wrath.*

Could this explain the origin of the fear of the number two, and from that the fear of doubles in general?

## THE CODE OF JEWISH LAW ON AUSPICIOUS DAYS

In general, Jews are forbidden to pay any attention to superstitions, although as those of you who have spent time studying the Talmud will know, Jews are a superstitious lot. Here is the *Shulchan Aruch*, the Code of Jewish Law, on the topic:

שולחן ערוך יורה דעה 179

שלא לכשף לעונן ולנחש. ובו י"ט סעיפים  
אין שואלין בחזוים בכוכבים ולא בגורלות: הגה משום שנאמר תמים תהיה עם ה' אלהיך (ב"י בשם  
תוספות דע"פ ובשם ספרי) וכ"ש דאסור לשאול בקוסמים ומנחשים ובמכשפים  
פסקי מהרא"י סי' צ"ו

*It is forbidden to turn to astrologers or those who forecast using lotteries.  
For it is written “You shall be perfect with the Lord your God”*

So far so good. But then comes this:

נהגו בשאין מתחילין בב' ובד' גואין נושאין נשים אלא במילוי הלבנה: הגה ולכן נהגו ג"כ להתחיל ללמוד בר"ח כי אע"פ שאין ניח

*We have the custom not to begin a project on the second day of the week, or the fourth day of the week*

## **SUPERSTITION IN OUR MODERN WORLD**

Our modern, rational world is still filled with superstitions. In the US, at least 85% of buildings using an Otis elevator do not have a thirteenth floor. Actors still say to one another “break a leg” right before a show, reflecting a superstition that wishing an actor “good luck” was...bad luck. And there are any number of superstitions around boats and boating. Pairs and irrational numbers may no longer frighten us but just like our ancestors, we remain a superstition-wary people.

אמר רב פפא, אמר לי יוסף שידא: בתרי קטלינו, בארבעה לא קטלינו, בארבעה מוקינו. בתרי, בין בשוגג בין במזיד. בארבעה, במזיד — אין, בשוגג — לא

*Rav Pappa said: Yosef the Demon said to me: “If one drinks two cups, we demons kill him; if he drinks four, we do not kill him. But this person who drank four, we harm him. There is another difference between two and four: With regard to one who drinks two, whether he did so unwittingly or intentionally, we harm him. With regard to one who drinks four, if he does so intentionally, yes, he is harmed; if he does so unwittingly, no, he will not be harmed.”*

**-Pesachim 110a פסחים קי, א**



# Roasting the Paschal Lamb and the Maillard Reaction

Spring is just around the corner (unless you are reading this in the southern hemisphere, in which case, please ignore) and barbecue grills are soon going to be fired up. The *Kobran Pesach*, the Paschal lamb that was offered in the Spring festival of Passover needed a barbecue of its own. It had to be cooked over an open fire, as the Mishnah on this page of Talmud reminds us.

פסחים קטז, א  
שֶׁבְּכָל הַלַּיְלוֹת אָנוּ אוֹכְלִין בְּשֶׁר צְלִי שְׂלֹוֹק וּמְבוּשָׁל, הַלַּיְלָה הַזֶּה — כּוֹלֵוֹ צְלִי...

*On all other nights we may eat meat that has been roasted or stewed or cooked. But on this night, we may only eat the meat [of the Passover offering] that has been roasted*

Earlier in this tractate the Mishnah went into other meticulous details about the permitted cooking process:

פסחים עד, א  
מִתְּנִי כִּיצַד צוֹלִין אֶת הַפֶּסַח? מְבִיאִין שְׂפוד שֶׁל רְמוֹן, וְתוֹתְבוּ לְתוֹךְ פִּי עַד בֵּית נְקוּבָתוֹ, וְנוֹתֵן אֶת כַּרְעֵיו וְאֶת בְּנֵי מַעְיו לְתוֹכוֹ, דְּבָרֵי רַבִּי יוֹסִי הַגְּלִילִי. רַבִּי עֲקִיבָא אוֹמֵר: כְּמִין בִּישׁוּל הוּא זֶה, אֶלֶּא תוֹלִין חוּצָה לוֹ. אֵין צוֹלִין אֶת הַפֶּסַח לֹא עַל הַשְּׂפוּד וְלֹא עַל הָאֶסְקָלָא. אָמַר רַבִּי צְדוֹק: מַעֲשֶׂה בְּרַבֵּן גְּמַלְיָאֵל שֶׁאָמַר לְטַבֵּי עֲבָדוֹ: צֵא וְצַלָּה לָנוּ אֶת הַפֶּסַח עַל הָאֶסְקָלָא

*MISHNA: How does one roast the Paschal lamb? One brings a spit of pomegranate wood and thrusts it into the mouth of the lamb until it reaches its anus, and one then puts its legs and entrails inside it and roasts it all together; this is the statement of Rabbi Yosei HaGelili...*

*One may not roast the Paschal lamb on the metal spit nor on a metal grill.*

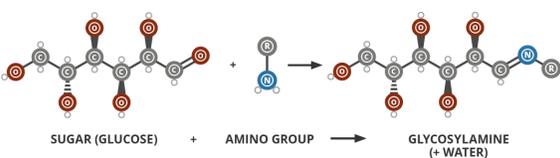
The reason that a wooden spit had to be used is that a metal spit would conduct heat to the inside of the carcass and cook it, “and in the Torah it states that the Paschal lamb must be roasted in fire and not roasted through something else [like the heat conducted along a metal spit] (וְיִרְמָמָא אָמַר “צְלִי אֵשׁ”, וְלֹא צְלִי מִחַמַּת דְּבַר אַחֵר).

So let's find out why the roasting process is so special.

# A GUIDE TO THE MAILLARD REACTION

The Maillard reaction occurs during cooking, and it is responsible for the non-enzymatic browning of foods when cooked. It actually consists of a number of reactions, and can occur at room temperature, but is optimal between 140-165°C. The Maillard reaction occurs in three stages, detailed here.

- The carbonyl group on a sugar reacts with a protein or amino acid's amino group, producing an N-substituted glycosylamine.



SUGAR (GLUCOSE) + AMINO GROUP → GLYCOSYLAMINE (+ WATER)
- The glycosylamine compound generated in the first step isomerises, by undergoing Amadori rearrangement, to give a ketosamine.



GLYCOSYLAMINE → 1,2-ENAMINOL → AMADORI COMPOUND
- The ketosamine can react in a number of ways to produce a range of different products, which themselves can react further.

ALKALINE CONDITIONS



FISSION PRODUCTS



REDUCTONES

ACIDIC CONDITIONS



HYDROXYMETHYLFURFURAL

### Classes of Maillard Reaction Products



The Maillard reaction produces hundreds of products; a small subset of these contribute to flavour and aroma, some groups of which are described below. Melanoidins are also formed, brown, polymeric substances which contribute to the colouration of many cooked foods.

			
<b>PYRAZINES</b> cooked roasted toasted	<b>PYRROLES</b> cereal-like nutty	<b>ALKYLPYRIDINES</b> bitter burnt astringent	<b>ACYLPYRIDINES</b> cracker-like cereal
			
<b>FURANONES</b> sweet caramel burnt	<b>FURANS</b> meaty burnt caramel-like	<b>OXAZOLES</b> green nutty sweet	<b>THIOPHENES</b> meaty roasted

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## ROASTING AND THE MAILLARD REACTION

In 1912 the French biochemist Louis Camille Maillard described a special reaction that occurs only when food has reached a temperature of 280-330F, (140-165C) and if your French is good enough you can read his original description here. What occurs in this special temperature range is that amino acids found in proteins (like meat and fish) react with reducing sugars giving the food its characteristic brown color and special flavor. Maillard uncovered a complex family of reactions, and as noted in Stuart Farrimond's excellent book *The Science of Cooking*, these reactions "help us make sense of the many ways in which food browns and takes on flavor as it cooks." He continues (p 16):

*Seared steak, crispy fish skin, the aromatic crust of bread, and even the aroma of toasted nuts and spices are all thanks to this reaction...*

*Understanding the Maillard reaction helps the cook in many ways: adding fructose-fish honey to a marinade fuels the reaction; pouring cream into simmering sugar provides milk proteins and sugars for the butterscotch and caramel flavors; and brushing pastry with egg provides extra protein for the crust to brown.*

As Farrimond the food scientist explains, the temperature needs to reach at least 284F (140C) to give the amino acids and sugars enough energy to react together. At this temperature the proteins and sugars fuse, releasing “hundreds of new flavors and aromatic substances” and the food starts to turn brown. At around 320F (160C) “molecular changes continue and more enticing new flavors and aromas are created...there are now cascades of malty, nutty, meaty and caramel-like flavors.” Now is the time to be careful and pay attention to the temperature, for above about 356F (180C) the food begins to char. This destroys the aromas and leaves acrid, bitter flavors. So “watch the food closely and remove it from the heat before it begins to blacken.”

None of this happens when you boil food, because the boiling point of water (at sea level) is 212F (100C) so all these glorious mouthwatering reactions cannot occur. Let’s pause to think about how some of the other biblical sacrifices were offered, and whether they too underwent the Maillard reaction.

### **THE BURNT OFFERING (קרבן עולה)**

During the Temple period there were other animal sacrifices that were roasted over a flame. One of these was called the Korban Oleh (lit. the sacrifice that goes up), but things didn’t stop with the Maillard process. This sacrifice had to be entirely burned on the altar, (although the skin was saved and given to the Priestly family on rotation that day). Nothing was left of it but charcoal and ashes, which were then shoveled out and disposed of in a ritual of its own. This was a popular sacrifice, which was offered for all sorts of reasons: like recovery from a skin

disease, the new appointment of a priest, the completion of a Nazirite's vow, after recovery from skin disease, by a woman after childbirth, after recovery from a state of abnormal bodily discharges, conversion into Judaism or as a voluntary sacrifice, when the sacrificial animal could be a young bull, ram, year-old goat, turtle doves, or pigeons.

**THE SIN OFFERING (קרבן חטאת) AND THE GUILT OFFERING (קרבן אשם)**

Much of the sin offering (the kidneys, their fat, the entrails and part of the liver) was burned on the altar. Sometimes the entire carcass was burned to a crisp, and sometimes it was left for the priests - the Cohanim - who could eat it under certain conditions (Lev. 6:25-30). Most of these rules also applied to the guilt offering.

**THE TAMID OFFERING (קרבן תמיד)**

This was offered twice a day, every day including Shabbat. It was also brought on the New Moon (Rosh Chodesh) and on Pesach and Sukkot. Most of it was burned on the altar.

**THE "PEACE" OFFERING (קרבן שלם)**

This was a large category of offerings, some for festivals, some by the Nazirite completing his or her term, and some for just saying thanks. Many had to be brought with bread, and much of the animal was burned, though male Cohanim were entitled to eat some parts that remained.

וְכִיצַד מַעֲשֵׂה שְׁלִשְׁתָּן. שׁוֹחֵט וְזוֹרֵק הַדָּם כְּמוֹ שֶׁבְּאַרְנוֹ. וּמְפָשִׁיט וּמוֹצִיא הָאֵימורִין. וְאַחֵר כִּדְ מִנְחַת אֵת הַבָּשָׂר וּמִפְרֵישׁ הַחֵזֶה וְשׁוֹק הַיָּמִין וְנוֹתֵן הָאֵימורִין עִם הַחֵזֶה וְהַשׁוֹק עַל יְדֵי הַבְּעָלִים וְכֵהֵן מֵנִיחַ יָדוֹ תַּחַת יְדֵי הַבְּעָלִים וּמְגִיף הַכֹּל לִפְנֵי ה' בְּמִזְבֵּחַ. וְכֵן כָּל הַטְּעוֹן תְּנוּפָה בְּמִזְבֵּחַ מִגִּפְיֵן אוֹתוֹ

*What is procedure for bringing these three [types of peace offerings]? [The sacrificial animals] should be slaughtered and their blood should be sprinkled on the altar, as we explained. They are skinned and the portions offered on the altar are removed. Afterwards, the meat is cut up and the breast and the right thigh are set aside. The portions to be offered together with the breast and the thigh are placed on the hands of the owners...*

### **HOW THE KORBAN PESACH DIFFERED**

Compared with nearly every other animal scarified in the Temple in Jerusalem, the Passover offering was the only one to be eaten in full by the participants (though the usual bits were offered up on the altar). In fact one of it requirements was that it be eaten entirely. Nothing was left over. It was eaten in small family units and everyone had to have at least a little bit. These small groups ensured that everyone would smell and taste the barbecued lamb. Its aroma and taste were very special, for they were the result of the Maillard reaction. No doubt the memory of it all lingered for a long time afterwards, and just as the memory began to fade, it was time to do it all over again.



# HOW THE SARAJEVO HAGGADAH WAS SAVED. TWICE.



Of all the medieval illuminated Haggadot that exist, the Sarajevo Haggadah is perhaps the most famous. It is thought to have been created in Barcelona around 1350, and today it is on display at the National Museum of Bosnia and Herzegovina. If you are thinking of visiting it at the museum, plan ahead. The Haggadah is on display Tuesdays and Thursdays, and first Saturday of the month from noon to 1pm. You may visit at other times, if you pony up more money and let them know in advance. According to the Museum, the Haggadah is "its most valuable holding," and for good reason. It has three sections: the first has 34 full page small biblical illuminations from the creation of the world to the death of Moses. The next is the text of the traditional Haggadah, and the last section contains poems and readings to be read on each of the seven days of Passover. The illustrations are masterpieces in miniature; deep indigo and red across a golden background, with elegantly elongated Hebrew letters that seem to drip down the page. It is in every way, the gold standard of Haggadot.

## THE REMARKABLE HISTORY OF THE SARAJEVO HAGGADAH

We know little of the first five-hundred years of the Haggadah. The name of the original owner is not known, and it appears to have been taken out of Spain in 1492, when Jews were expelled by the Alhambra Decree. There is a note written by a Catholic priest, Giovanni Domenico Vistorini, who inspected the Haggadah in 1609 for any anti-Christian content. Vistorini, who was most likely a converted Jew, found nothing objectionable in the Haggadah. "His Latin inscription, *Revisto per mi* ("Surveyed by me")" wrote the Pulitzer Prize winning author Geraldine Brooks "runs with a casual fluidity beneath the last, painstakingly calligraphed lines of the Hebrew text." The Haggadah then disappeared for almost three centuries, until it was sold to the National Museum by a Joseph Kohen in 1894.

“

*The Haggada rescue story could, therefore, be placed in the category of verbal communication of a narrow circle of people that share a common past, and in their repeated remembrances of the event, the story becomes rich with new forms and meanings. Such a tale has not yet become a fully formed historical story (legend) as it is known in the theory and history of literature, with the strong likelihood that in the future such a tale may become a standardized verbal communication pattern of past events.*

– Kemal Bakarsčić. *The Story of the Sarajevo Haggada*. *Judaica Librarianship* 1995: 9(1-2); 135-143.

## JOZO PETROVIC & DERSVIS KORUT SAVE THE HAGGADAH

That the Sarajevo Haggadah had survived that long was highly improbable, but a series of even more unlikely events were to come. On April 16, 1942 the Nazis invaded Sarajevo and immediately destroyed the city's eight synagogues. The director of the State Museum at that time was an archaeologist, Dr. Jozo Petrovic (1892-1967), a Croat from Bosnia. It was Petrovic who was charged with giving a

tour to a group of high-ranking Nazis that included the much feared General Johann Fortner. They were looking for the Haggadah to add to their proposed "Museum of an Extinct Race," and during this whole episode, it was in Dr. Petrovic's briefcase. The visit lasted about one hour, and before his departure General Fortner turned to Dr. Petrovic. "Und jetz, bitte, Qbergeben Sie mir die Haggadah!" (And now, please, hand me the Haggadah!)” Geraldine Brooks picks up the story:

*The museum director feigned dismay. "But, General, one of your officers came here already and demanded the Haggadah," he said. "Of course, I gave it to him.." ...*

*"What officer?" Fortner barked. "Name the man!"*

*The reply was deft: "Sir, I did not think it was my place to require a name."*

Petrovic had come from Belgrade to run the museum, and he was not familiar with local villages and populations. He therefore asked another librarian, Dervis M. Korkut, to move the Haggadah out of Sarajevo. Korut agreed, and (according to one version) he hid it in the mosque of a small nearby village. There an Imam kept an eye on it and returned it at the end of the war. The Haggadah had been saved by brave Muslims.

#### **WHOEVER SAVES ONE HUMAN LIFE...**

While the Koruts are best remembered for the role of Dervis in saving the Sarajevo Haggadah, it is not this achievement of which the family is most proud. "In our family, the Haggadah is a detail," his son said. "What my father did for Jewish people – that is the biggest thing that we, in our family, have to be proud of."

“

*The man so determined to protect a Jewish book was the scion of a prosperous, highly regarded family of Muslim alims, or intellectuals, famous for producing judges of Islamic law.*

– Geraldine Brooks. The Book of Exodus. The New Yorker, Dec 3, 2007.

In 1942, shortly after hiding the Haggadah, a sixteen-year-old girl named Mira Papo came to Korut and asked to be hidden. The family took her in, dressed her as a Muslim, and passed her off as their maid. Four months later they arranged for Mira to join her aunt at an area on the Dalmatian coast where there was no Nazi presence. She survived the war and later moved to Israel. And then, in 1994, Mira wrote a testimony of her rescue and submitted it Yad Vashem. Korut Dervis, who had died in 1969, and his wife Servet were added to the names of the Righteous Among the Nations. Servet received a certificate, a pension, and the right to Israeli citizenship.

Just when the story seemed to have reached its conclusion, another dramatic episode began. In 1999, at the height of the atrocities of the civil war in Kosovo, the Korut's youngest daughter Lamija, and her Muslim husband were forced from their home by Serbian militiamen. They were sent to a refugee camp in which the conditions were so appalling that they were forced to flee. The couple were refused asylum by France and Sweden, and in desperation they turned to the small Jewish community of Skopje in Macedonia. Somehow, Lamija still had with her the certificate that Yad Vashem had given to her mother. She showed it to Victor Mizrahi, the president of the community, and four days later, Lamija and her husband landed in Tel Aviv. The Prime Minister, Benjamin Netanyahu, was at the airport to welcome them. "Today, we are closing a great circle in that the state of Israel, which emerged from the ashes, gives refuge to the daughter of those who saved Jews," he said. And then, in the chaos of the media frenzy at the airport Lamija heard someone calling her in Serbo-Croatian.

*"It was a good feeling, to have someone speaking your language," she said. But she had no idea who it could be, greeting her so warmly. Pushing through the crowd was a slender, wiry man she had never seen before, with a shock of dark hair and a mustache. Opening his arms, he introduced himself, and Lamija fell into the embrace of Davor Bakovic, the son of Mira Papo.*

## **THE HAGGADAH IS RESTORED**

It's a remarkable story, which I hope you will share at your Pesach Seder when you reach the passage שפוך חמתך על הגויים - "pour out Your wrath on the Gentiles who do not know You..." But having taken a deep breath and dried our eyes, let's return to the Haggadah itself. In her 2008 novel *The People of the Book*, Geraldine Brooks opens in Sarajevo, where, under the watch of staff from the United Nations and security officers from the State Museum, an Australian conservator works on the Sarajevo Haggadah.



Pataki at work repairing the Sarajevo Haggadah.

Photo courtesy of Andrea Pataki.

In fact the real Haggadah did undergo conservation, but it was carried out by Andrea Pataki, from Stuttgart, Jean-Marie Arnolt of Paris, and the late Prof. Bezalel

Narkiss, Professor Emeritus of Art History at the Hebrew University. These three experts wrote of their experience in conserving the Haggadah in a paper published in *The Paper Conservator* in 2005.

Andrea Pataki is a book conservator of world renown. For almost a decade she led the *Studiengang für Papierrestaurierung*, the Book and Paper Conservation Program at the State Academy of Fine Arts in Stuttgart, before taking up her present position as a professor at the Technical University of Cologne. Pataki is not Jewish, but had lost Jewish relatives in the Holocaust. Recalling her own role in the project, she never considered it significant that she was a Gentile born in Vienna now repairing a manuscript once pursued by the Nazis. Instead, she noted that she was hired because of her expertise and experience. Her own background was of little consequence. And that is how it should be.

In December 2001 Pataki spent nine days repairing the Haggadah at the Union Bank in Sarajevo. Each day, she recalled later in an academic paper,

*... the manuscript was brought to the 'conservation lab' in its metal box which was opened by representatives of the Museum. Working hours were from 8:00 am to 4:00 pm, after which the manuscript was locked in its box and promptly returned to the vault of the Union Bank. As a consequence, it was necessary to stop treatment each day at a stage at which the manuscript could be closed and put away safely. This meant making sure that all repairs would have adequate time to dry during the day, which required a great deal of planning and foresight.*

Pataki found that the original covers of the Haggadah, which had certainly been made of vellum, were lost. In their place were cheap cardboard covers in a Turkish floral design, which were entirely orthogonal to the style of the Haggadah. Several sections, called quires, were detached from the rest of the book and needed to be carefully sewn back into place. The book joints, where the outer boards of the cover meet the spine, had broken. This allowed Pataki access to the binding underneath. She repaired one of the four cords that ran vertically down the spine

and around which the quires are sewn. The joints were reattached. Finally, she repaired the head and tail caps at the top and bottom of the spine with new calf leather that had been specially dyed for this restoration.

Of all the damage that the Haggadah had suffered, none was more important than the wine stains, just like those found on the pages of family Haggadot to this day. Here is Pataki's assessment:

*The ritual of washing the hands twice during the ceremony had resulted in water stains on the parchment and smudges and smearing of pigments. The ceremony also calls for the drinking of four cups of wine and consumption of different foods dipped in salt water, before and during the festive meal. This activity resulted in many stains and discoloured areas on the pages which call for ritual drinking and eating...*

What was to a conservator a sign of damage and discoloration was to the Jewish community a symbol of continuity. The stains were a testament that the Sarajevo Haggadah had not been left on a shelf, but had been used at the table, guiding the Seder night for hundreds of years.

“

*Due to the use of the manuscript on the Passover table for many generations, the main damage to the text-block had been caused by liquid.*

– Pataki A., Narkiss, B., Arnoult, J. The conservation of the Sarajevo Haggadah, *The Paper Conservator*, 2005: 29:1, 63-66.

## **THE SARAJEVO HAGGADAH AS A SYMBOL OF TOLERANCE AND HOPE**

Neal Kritz, a lawyer at the United States Institute for Peace, was in Sarajevo in the late 1990s. He was part of a delegation that focused on the restoration of the justice system and the atrocities that had occurred during the Bosnian civil war. Kritz recalled how the Bosnian Serbs had demanded the Sarajevo Haggadah be displayed in Banja Luka, the de facto capital of the newly created Serb republic. It

was their treasure too, they claimed; it did not just belong to the people of Bosnia-Herzegovina. Their demands were rejected, and the Haggadah remained in Sarajevo, where a new display of it opened there only last month. Kritz received a token of gratitude from the Chief Prosecutor of the Federation of Bosnia-Herzegovina. It was, of course, a facsimile edition of the Sarajevo Haggadah, which had now come to symbolize efforts to make peace between Bosnians and Serbs. And in November 2017, UNESCO added the Sarajevo Haggadah to their Memory of the World Register to mark, naturally, the International Day for Tolerance.

Over the last seventy years the Sarajevo Haggadah has twice been saved. First, three Muslims risked their lives to rescue it from those who sought to annihilate the Jewish people. And then it was saved from the ruins of time by an expert from the very country from which so much hate had originated. The last word goes to Mirsad Sijarić, the Director of the National Museum of Bosnia and Herzegovina: "The Sarajevo Haggadah is physical proof of the openness of a society in which fear of the Other has never been an incurable disease."

**NOTE:**

*This essay was improved with information provided by Zvonimir Snagic, who identified himself as the great-nephew of Dr. Jozo Petrovic. Petrovic was director of the State Museum when the Sarajevo Haggadah housed there was hidden from the Nazis. Mr. Snagic supplied both testimony from his family and evidence that Dr. Petrovic played at least as large a role in the story as did Devis Korut. We are grateful to Mr. Snagic.*



# Talmudology is about

*Albert Einstein, alcohol, alternative facts, ambergris, amnesia, amputation, amulets, anatomy, androgyny, ants, archeology, asceticism, askera, assisted reproduction, astrology, astronomy, atomic theory, aurochs, Australia, ayilonit, bathing, bears, beauty, bed bugs, bees, Ben Ish Chai, Biblical scholarship, bikur cholim, birds, birkat hachammah, bites, blood, bloodletting, blushing, book collecting, breast cancer, breast feeding, bribery, brit milah, British Medical Journal, bullfighting, burial, burns, cesarian section, calendar, Carl Fredrich Gauss, cartilage, caste, cave painting, censorship, chametz, chanukah, Chatam Sofer, Chazon Ish, child abuse, child support, children, chirality, choking, cholera, circumcision, cirrhosis, class, coffins, cognition, Cohen gene, coins, conjugal relations, conversion, cooking, copper, Copernicus, corporal punishment, cows, cranial nerve palsy, crossbreeding, cruelty to animals, cryptorchism, Daf Yomi, David Friesenhausen, David HaCohen, dawn, Dead Sea Scrolls, deafness, disinhibition, divorce, dogs, domestication, Donald Duck, donkeys, dreams, drowning, dukes, dyes, ear candling, ears, economics, Editor of the Talmud, education, electricity, elephants, Ella Fitzgerald, embarrassing, embryology, endoscopy, epidemics, epiglottitis, Eruvin, evolution, execution, Eybeschutz, eye, falls, fetus, fever, fire, fish, flat Earth, flatulence, free will, fun, Galileo, gallnuts, game theory, gangrene, Garden of Eden, garlic, geese scrotum, gender determination, genetics, genital injuries, George Washington, gestation, gonorrhoea, gossip, Grady Memorial hospital, gratitude, gynecology, Haggadah, haircuts, halitosis, Halley's comet, happiness, Hasidim, healing, hell, hematology, hemophilia A, hemorrhoids, hermaphrodite, history vs. heritage, HLA-B27, honey, Hook's Church Dictionary, hot springs, human dissection, humiliation, hygiene, hymen, ICU, Ig Nobel, incest, incontinence, infertility, infidelity, ink, insignia, insults, intensive care unit, Jastrow, jaundice, Jus primae noctis, kashrut, kedusha, kiddush hashem, King Henry VIII, lasho harah, latrine, lead, leeches, left and right handed, legal liability, Leonardo da Vinci, leopards, levirate marriage, lice, liver, liver disease, logic, Londeon Bet Din, longevity, Lot's daughters, love, lunar eclipse, lying, Maharal, Maillard, Mar Zutra, marriage marshmallow test, masturbation, maternal imprinting, maternal mortality, mathematics, mechanical engineering, medical students, medicine, Memorex, memory, menstruation, mental illness, mermaids, mesorah, mezuzah, miasma, modesty, Modim, molad, mood, motherhood, mountain heights, mourning, musk, nasolacrimal gland, nazir, Nelson Mandela, neurosurgery, nightmares, Nobel Prize, numerancy, nystagmus, obesity, obstetrics, onanism, ontogeny, open defecation, ornithology, ovulation, oxen, oxytocin, pairs, palm trees, Parliament, parody, Passover, persecution, Pesach, Pew Research, pheromones, philosophy of science, phototherapy, physicians, Pi, Pi Day, pigeons, pigs, pillcam, pimping, plagiarism, plague, plant biology, Pleiades, polycythemia, polydactyly, polypharmacy, prayer for healing, pregnancy, Principal of Contested Sums, probability theory, prognosis, prophecy, prosthetic limbs, Proverbs, puberty, Purim, Pythagoras, Queen Esther, Queen Helena, quincy, Quine, Rabban Gamliel, Rabbi Meir, Rabbi Meir Shapira, Rabbi Yisroel Salanter, Rabbi Yochanan, Rabbi Yossi, rabies, race,*

*Rachel Wolf, rape, Rash, Rashi, Rav Chisda, Rabbi Eliezer Waldenberg, Rav Huna, Rav Moshe Feinstein, Rava, re'em, Resh Lakish, resuscitations, Robert Aumann, Roman gods, roosters, salamander, saliva, Schottenstein, science and certainty, scientific firsts, Sefer Haberit, self-control, shechita, Shimon ben Chalafta, Shmuel, sister-in-law, skepticism, sleep, Slonimski, smell, snails, snakes, sneezing, social isolation, solar eclipse, Soncino, spandrels, speech acts, speed of light, spontaneous generation, statistics, Steinsaltz, Stephen J. Gould, stoning, Sukkot, sin, sunrise, sunset, superstition, Suprem Court, swimming, swordfish, syndactyly, ta'amei hamitzvot, Talmud, talmudic reasoning, techelet, teeth, tekufot, telescopes, ten tefachim, testicles, thanks, Thanksgiving, the Dead Sea, Theory of Disease, Tiberias, toilet paper, toothache, torture, transference, transit of Venus, tree roots, treifut, trephination trigonometry, tumtum, Turner's Syndrome, twilight, twins, ulcers, urinary tract infections, vaccine denial, vaccines, Vlamadonna Library, venom, vertebral anatomy, virginity, visiting the sick, vows, water, well-being, wine, wolves, Y-chromosome, Yehudah HaNassi, Yom Ha'atzmaut, Zov...and much, much more.*

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