

The Source of *Techelet*: Response to Dr. Singer

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We would like to thank Rabbi Cohen for allowing us to respond to the article "Understanding the Criteria for the *Chilazon*" by Dr. Singer, which appeared in number XLII of this Journal. The primary goal of the P'til Techelet Foundation is to encourage and promote interest in the topic of *Techelet*.

Objections raised by Dr. Singer

Dr. Singer makes a sweeping statement at the beginning of his article that cannot go unchallenged. He states that "the strongest criteria for identifying the *chilazon* come from the Gemara *Menachot*" and specifically from the *braita* in *Menachot* 44a. This assertion is very difficult to reconcile with the fact that most *Rishonim*, in their discussion of the topic, do not quote this *braita*. Both the Rif and the Rosh, who quote many other statements about *techelet*, do not mention these criteria at all. Both the Rambam and the *Smag* selectively choose from among the criteria in the *braita*, ignore one of those criteria (i.e., that it rises once in seventy years), and add to or alter the other signs. The Maharil, when stressing how easy it should be to reintroduce *techelet* based on finding the *chilazon*, refers to the signs brought in the *Smag*, and not those of the *braita*. Clearly, the *Rishonim* did not take the criteria of the *braita* at face value. They treat these statements as general descriptive identifiers, not as distinct and essential characteristics of the *chilazon*. With this in mind, let us examine the arguments in detail.

1. The murex Trunculus is not the color of the sea

First of all, Dr. Singer's assertion, that the term "*gufo*" means the soft body of the mollusc, is not compelling. As mentioned, the *braita* provides general descriptive information regarding the *chilazon*. It would make most sense to describe the outward appearance of the organism before going on to its internal appearance, especially given that internal examination requires painstaking procedures (e.g., carefully breaking open the shell and extracting the snail). Moreover, the general description would most naturally be that of the *chilazon* in situ – covered in its characteristic sea-fouling (and not after it has been assiduously polished).¹

When it is alive in the ocean, the murex *Trunculus* snail has a greenish color, and anyone who has seen it underwater is struck by its camouflage and resemblance to the sea. This fact is a perfect explanation of the term "*domeh l'yam*." Indeed, this interpretation is not new; the commentary to *Sefer Yetzirah* similarly understands this passage.²

Furthermore, the word "*domeh*" implies similarity and not absolute equivalence. When something is identical in property, the Gemara states it explicitly. For example, when the Gemara explains that the color of *techelet* is identical to the color of *kala ilan*, it states that only *Hashem* can distinguish between the two.³ The term *domeh* is not used. The *Chacham Zvi*⁴ states that the term "*domeh*" implies a certain "similarity" in a property and nothing more.

Some have even suggested that all the criteria enumerated

1. Dr. Yisrael Ziderman, "Reinstitution of the Mitzvah of *Techelet* in *Tsitsit*" (Hebrew), *Techumin*, Vol. 9 (1988), p. 430.

2. *Commentary on Sefer Yetzirah* attributed to the Raavad, Introduction, *netiv* 8.

3. *Bava Metzia*, 61b.

4. *She'eilot Utshuvot Chacham Tzvi*, responsum 56.

in the *braita* come to explain the conclusion, namely, why *techelet* is expensive.⁵ The fact that the snail resembles its surroundings would then explain why it is so difficult to obtain – since it would require highly trained fishermen or divers to search for it. This would make sense only if the outward appearance of the snail resembled the sea; the color of the hidden body would be irrelevant.

2. The murex *Trunculus* is not a fish

Sea snails are halachically fish. The opinion of the *Rishonim*, including the Rambam in some places,⁶ is that all sea creatures are fish. Furthermore, when the Rambam⁷ distinguishes between sea animals, fish, and sea *sh'ratzim*, shellfish fit in to the more focused subdivision of fish. The examples he gives of sea animals are all larger creatures that have limbs for leaving the water, (seal, frog, sirens); the *sh'ratzim* are the likes of worms and leeches. Sea snails do not fit either of these – and thus fall into the remaining category of "fish".⁸

The Oxford dictionary defines fish:

In popular language, any animal living exclusively in the water; primarily denoting vertebrate animals provided with fins and destitute of limbs; but extended to include various cetaceans, crustaceans, molluscs, etc. In modern scientific language (to which popular usage now tends to approximate) restricted to a class of vertebrate animals..."

5. Y. Rock, "Renewal of *Techelet* and Issues on *Tsitsit* and *Techelet*" (Hebrew), *Techumin*, Vol. 16 (website expanded version), p.15, n.57.

6. See *Hilchot Tumeat haMet* 6,1 and compare to *Hil. Keilim* 1, 3.

7. *Hilchot Ma'achalot Asurot* 2, 12.

8. Shlomoh Taitelbaum, *Lulaot Techelet*, P'Til Techelet, Jerusalem, 2000, pp. 126-36.

After the definition there is a note: "Except in the compound shell-fish, the word is no longer commonly applied in educated use to invertebrate animals." To say that murex / *chilazon* is not a fish, is an anachronism. As such, the murex mollusc fits neatly into the description "*briato domeh l'dag*".

3. The murex does not have a 70-year cycle

Both the Radzyner and Rav Herzog dealt with this problem and did not feel that it was a sufficient reason to disqualify their candidates for the *chilazon*. As previously mentioned, the Rambam does not bring it when citing the *braita*. As Rav Herzog himself puts it, "Science knows nothing of such a 'septuagenarian' appearance of any of the denizens of the sea."⁹ Rav Herzog and the Radzyner suggest that the cycle mentioned refers to periods of greater or lesser availability or accessibility, but that the animal itself is always obtainable.¹⁰

Though no intrinsic characteristic of the murex would explain this cyclic property, the archeological evidence may offer a clue. At the sites where ancient dye installations have been found, the crushed shells were often used as part of the walls of adjacent buildings. One finds that the size of the snails decreases over time. This fact indicates that the snails suffered from over fishing, and that they became increasingly hard to obtain over time. This extrinsic feature might explain the periodicity, that due to over fishing, the murex population would need time to replenish itself before a new expedition could reasonably hope to procure a sufficient amount.

Interestingly, the Rambam replaces this criterion with the

9. Herzog, *The Royal Purple*, page 69.

10. I should point out that there are those who explain that this is referring to a supernatural exodus onto land (Chida, *Ptach Aynayim*, *Menachot* 44a).

phrase, "and it is found in the salty sea," which most interpret as the Mediterranean. Perhaps the Rambam understood the phrase, "and it comes up once in seventy years," in terms of its complement – namely, if you can find it on land very infrequently, then the rest of the time it is found in the sea.

4. The amount of dye in each murex is too minute

How minute is too minute? Approximately two tons of snails will provide enough dye for ten thousand sets of *tsitsit*. A small village in Greece consumes that amount for snacks in one week. Is that too much or too little?

5. The chemical tests to determine true *techelet*

Based on discussions with scientists and Talmudists, it is clear that no one completely understands the chemical tests brought by the Gemara, and interpreted by the Rambam and Rashi, to distinguish between *techelet* and *kala ilan*. One thing is clear though: a sample subjected to the described procedures that does not fade, passes the *techelet* test. We have tested *techelet* dyed with murex according to the analysis described by both the Rambam and by Rashi, and it did not fade. Therefore, there is no challenge that arises from this criterion to murex *techelet*.

The fact is, however, that indigo (*kala ilan*) dyed wool also passed the chemical tests. To reiterate, this is not a problem as far as murex *techelet* is concerned, but rather an academic problem in understanding the Rambam and the Gemara. I personally have proposed that although there may be no difference molecularly between the two, and therefore according to the methods currently used to dye wool, there is no discernible difference in quality between them, historically, this was not always the case. When dyeing according to natural methods in the ancient world, *techelet* was dyed in a completely different manner than indigo. The former was fermented together with the meat from the snail. Current research by John Edmonds in

England has shown that bacteria present in the snail meat plays an active part in the reduction of the dye. On the other hand, indigo was chemically reduced in an entirely different manner. Consequently, it is quite reasonable that the quality and fastness of wool dyed with *techelet* according to the method employed in vat dyeing with snails, would have differed from that of *kala ilan*. This may have been the basis for tests that attempted to distinguish between the two. Nobel chemist Prof. Roald Hoffman has told me that he finds this proposition to be plausible.

It should also be stressed that regardless of one's opinion as to the efficacy of these tests in differentiating between *techelet* and *kala ilan*, one incontrovertible fact must be understood: *techelet* and *kala ilan* are visually indistinguishable.¹¹ And since the blue dye from the murex is molecularly equivalent (and needless to say – visually equivalent) to *kala ilan* dye, the murex *techelet* is undoubtedly the exact color of the *techelet* of *chazal*. This fact is a sufficient condition for the determination that murex *techelet* is kosher – even if there may be another *techelet* which would also be kosher. This will be explained more fully below, number 8.

6. *Techelet* comes from a live *chilazon*

This is one of the more powerful proofs supporting the murex as the *chilazon*. The enzyme required for dye formation quickly decomposes upon the death of the snail, and so the glands that hold the dye precursor must be crushed while the snail is alive or soon after. In experiments, we have seen that as soon as two hours after death, the quality of the dye is severely degraded. Dr. Singer's assertion that "the Gemara is speaking not of a few hours, but mere moments after death" is totally arbitrary. That assertion is even more implausible

11. Ibid.

considering that this property is mentioned by both Pliny and Aristotle specifically regarding the murex. Since the murex loses its dye quality a few hours after its death, and those scholars express that fact by saying that the dye must be obtained from live snails, it follows that the Gemara's use of the same terminology would certainly sustain a two-hour *post mortem* limit.

7. Equating *techelet* with purpura and the color of purpura

The *Chavot Ya'ir* in his *M'kor Chayim*¹² states clearly that the *chilazon* used for dyeing *techelet* is the purpur. The *Shiltei haGiborim* also states explicitly that it is the *purpura*.¹³ The *Musaf la'Aruch* defines purpura as the "Greek and Latin word for a garment of *techelet*." The *Midrash haGadol* from Yemen¹⁴ quotes Rav Chiya as saying, "the purpura of the kings is made out of *techelet*," and the *Aruch* suggests that the word "Tyrian" (apparently Tyrian purple) is Latin and Greek for the color *techelet*. The Ramban¹⁵ also says that in his time only the king of the nations (i.e. the Emperor) was allowed to wear *techelet*, thus equating it with purpura. The Radzyner Rebbe notes¹⁶ that the ancient chroniclers frequently mention *techelet* as a most precious dyestuff, perfected in Tyre. Obviously, he too believed *techelet* was purpura.

The other points raised by Dr. Singer regarding the identification of purpura with *techelet* are simply not accurate.

12. 18, 2.

13. Ch. 79; see *Lulaot Techelet*, page 100, for more information about this work.

14. *Bamidbar* 4: 5.

15. *Sh'mot* 28:2.

16. *P'til Techelet*, Introduction.

Vitruvius specifically states that one of the shades that can be obtained from the purpura is blue (*lividum*).¹⁷ Moreover, we have noticed that one can obtain a blue color from murex *Trunculus* without even exposing it to sunlight – simply by steaming the wool immediately after the dyeing. It is hard to believe that we amateurs, who have been dyeing for less than a decade, would know more than the ancient dyers who made their livelihood working with these dyes for more than 2,000 years.

Furthermore, one would not expect to find anything but purple archeological stains since while the glands are being stored for dyeing, and during the fermentation process, the vat color is purple. Only during the very short dyeing stage itself (and possibly, not until after the dye process was completed, if steaming was used), would the dye turn blue.

Lastly, Dr. Singer's question as to why the ancients would have wanted to dye blue with murex when indigo was more readily available is anachronistic, since murex dyeing in the Mediterranean dates back to the time of Avraham, whereas indigo reached the region only 1,500 years later. (Though ancient Egyptians used a blue coloring for eye makeup, there was no blue dyeing of garments with any material other than the murex.)

8. The equivalence of murex *techelet* with *kala ilan* indigo

As stated previously, the primary halachic guides for any discussion of *techelet* are Rav Gershon Henoch Leiner and Rav Herzog. Both of them are unequivocal in their assertion that *techelet* was the color of the mid-day sky. Rav Herzog clearly

17. Vitruvius, *De Architectura* (ed. H. L. Jones), Loeb Classical Library, Cambridge, London 1930) Book VII, c. VII-XIV, p. 113-129.

identified the color of techelet as identical to indigo and claims that this is also the opinion of the Rambam.¹⁸ The Gemara itself explains that only Hashem¹⁹ can distinguish between techelet and kala ilan (i.e., indigo).

Furthermore, both the Radzyner and Rav Herzog state that if one finds a candidate for the chilazon that satisfies these two criteria – that the color of the dye is sky-blue, and that its dye is fast and strong – then that organism must be acceptable as a kosher source for techelet.²⁰

Both Rav Herzog and the Radzyner offer the same line of compelling proof for this assertion. If there were another chilazon that satisfies these criteria, but is not kosher for techelet, then why would the Gemara not warn us regarding its use? The Gemara cautions only of kala ilan, a plant substitute for techelet, but never mentions any alternative sea creature that might mistakenly be used for techelet. Either that hypothetical species is also kosher, or there is only one species in the world²¹ (or in the Mediterranean) that satisfies both those criteria. Murex Trunculus provides a dye which is the color of techelet. Its dye is among the fastest dyes that exist.²² It was well known throughout the ancient world and is found off the coast of Israel. There can be no doubt, then, that according to Rav Herzog and the Radzyner, this species must be a kosher source for techelet.²³

18. Ibid, page 94.

19. *Bava Metzia*, 61b.

20. *Sefunei Temunei Chol*, page 14, 1999 edition.

21. Herzog, *ibid*, page 73.

22. Personal correspondence with the late Prof Otto Elsner, professor of Ancient Dye Chemistry at the Shenkar College of Fibers.

23. Though Rav Herzog studied the murex Trunculus, he provisionally rejected it, primarily because the process for obtaining

Let us not forget the fact that techelet has been lost for 1,300 years and therefore much of what has been written is based on assumptions and conjecture. It is highly doubtful that each and every statement regarding techelet or the chilazon will suitably apply to any candidate. Nevertheless, it is our opinion that the murex Trunculus fits the descriptions of chazal in an overwhelming majority of instances.

Criteria for determining kosher *techelet*

There are numerous descriptions found throughout the Gemara, Midrash, *Zohar* and other Judaic sources regarding *techelet* and the *chilazon*. In order to begin to apply them it is important to understand, first and foremost, that it is essentially impossible to reconcile all of those sources with any candidate, or, for that matter, with each other. For example, the Gemara asserts that the *chilazon* is found in the Mediterranean,²⁴ the *Zohar* claims that it is found in the Kineret,²⁵ while the Rambam states that it is to be found in the "*Yam Hamelach*."²⁶ Needless to say, there is no species that lives in all three habitats.

Secondly, it is essential to distinguish between *aggadic*

blue dye visually equivalent to *kala ilan* was not then known. The process was not discovered until 1980 by Professor Otto Elsner of the Shenkar College of Fibers. I should also point out that there is no species other than the muricae currently known that produces a dye similar in color to indigo and neither is there any archeological evidence for other species being used in the ancient world for dyeing. In order to assume that the *chilazon* of *chazal* is different than the murex, one would need to accept both the fact that knowledge of that organism eludes modern science as well as the fact that the detailed archeological survey of the Mediterranean has not uncovered any hint of such an animal.

24. *Shabbat* 16a.

25. *Zohar*, 11, 48b.

26. *Hilchot Tsitsit*, 2:2.

statements versus *halachic* statements. For, as with every issue in Jewish thought, though we must strive to understand the aggadic material, we are bound in deed by the halachic instruction. One method to determine if a statement is halachic in nature is to find its use as the basis for an actual halacha. Conversely, if a statement is never used in a formal halacha, it quite often remains in the realm of a non-binding aggadic statement. For example, the Gemara relates that the *chilazon* and the proficiency in *techelet* dyeing were a special gift to the tribe of Zevulun. Nevertheless no certificate of *yichus* proving descent from that tribe is required before accepting *techelet* from a dyer! In this case, the "criterion" lies clearly within the aggadic realm.

On the other hand, the following are a number of statements relating to *techelet* and the *chilazon* which do find their way into formal halacha, and these must be addressed with due rigor.

1. *Techelet* is the color of *kala ilan*.

All of the laws regarding *kala ilan* are based on this fact, including the *sugyot* in *Bava Metziah* (61b) and *Menachot* (40a and 43a). *Techelet* obtained from murex *Trunculus* is identical in color to *kala ilan*.

2. *Techelet* is a fast dye that does not fade.

The Gemara bases its chemical tests on this fact (*Menachot* 43a) – "*lo ifrid chazute, keshayrah* – if it does not change its appearance, it is kosher [for *techelet*]." The Rambam states this explicitly "*tzviyah yeduah sheomedet b'yafya* – a dye which is known to be steadfast in its beauty" (*Hilchot Tsitsit*, 2:1). Murex *techelet* has been tested by independent fabric inspectors at the Shenkar College of Fibers and received excellent marks for fastness. I can personally testify to my own *techelet*, worn every day for the past ten years, that has not faded or changed color at all.

3. *Techelet* dyes on wool, but does not take to other fabrics. (*Yevamot* 4b – "*techelet amra hu* – *techelet* is [dyed] wool").²⁷

Murex *techelet* binds exceedingly tight to wool, but not to cotton or synthetic fibers.

4. The dye from the *chilazon* is more potent when taken from a freshly killed *chilazon* – but one must kill the animal in order to extract the dye.

The Gemara in *Shabbat* (75a) bases one of the fundamental principles of *Hilchot Shabbat* on this fact, namely *p'sik reisha d'lo nicha lei* – an inevitable act [lit. cutting off a head] that is undesirable. As mentioned previously, the enzymes responsible for transforming the precursor of the dye into actual dye upon exposure to oxygen do not survive long after the death of the snail. Consequently, within a few hours after death, the murex can no longer be used for dyeing.

Finally, it is instructive to mention two not commonly referred-to sources written in the early 1890's as critiques of the Radzyner's *techelet*.²⁸ Both discuss the various sources and measure the Radzyner's *techelet* against them. The most forceful objections are based on the fact that Radzyn *techelet* did not meet the "halachic" criteria enumerated above. The authors of these works contend that (a) Radzyn *techelet* is not the color of the sky, (b) that it fades when washed with soap, and (c) that

27. Rashi does not follow this reasoning. On the other hand, the *Yerushalmi Kelim* (9: 1) says "*Ma pishtim k'briata af tsemer Ubriato*" just as linen remains its own color, so too wool [only can become *tamei nigei b'gadim*] in its natural color [and not dyed]." We see from there that only wool is dyed, not linen.

28. Hillel Meshil Gelbshtein, Introduction to *Ptil Techelet*, printed in *Abir Mishkenot Yaakov* by the same author, and an article "*Techelet me'Iyay Elisha*" by Mordechai Rabinovits.

the material from the dye can be obtained from dead sepia *Officinalis*, (and not exclusively from live organisms). On the other hand, as has been demonstrated herein, murex *techelet* would indeed be acceptable precisely according to all these criteria.

It is our hope that these and other issues relating to *techelet*, to the identification of the murex *Trunculus* as the *chilazon*, as well as the investigation of other candidates, will continue to spark discussion within the walls of *batei midrash* all over the world. Any argument that is for the sake of Heaven has great merit and will serve to unite *k'lal yisrael* in its search for truth and proper *kiyum hamitzvot*.

Letters

To the Editor,

Having spent much spare time over the past several years studying murex *Trunculus techelet*, I was most gratified to find that I had arrived at the same conclusion, and for many of the same reasons, as Dr. Mendel E. Singer; namely that murex *Trunculus* is not the *chilazon*.

Although the space of a letter does not permit some of the other arguments against the murex *Trunculus*, nevertheless, allow me to add some points to Dr. Singer's essay.

On page 11, Dr. Singer writes about the small amount of dye produced by a single murex snail, only 4 or 5 drops. It should be pointed out that the discussion about the culpability for *Disha* in *Shabbat* 75a is thus completely without basis, since the minimal volume required for culpability is that of a *grogrit*, a dried fig. And clearly, the Gemara is discussing extracting the mucus of a single *chilazon*.

On page 16, Dr. Singer assumes that the "*nartik*" or *malvush* of the *Midrashim* is a shell. Despite the fact that we lack an adequate explanation for these words, there is only the one opinion, that of Rabbi Binyomin Mosufa, that *nartik* means a shell. All the other *Rishonim* and *Acharonim* refer to the *chilazon* as a fish, ignoring the word *nartik*. No doubt this is because there is a perfectly good word for snail in the Mishnah *Shabbat* 77b, "*shavlul*". This is also used in an Aramaic form in the Gemara *Menachot* 42b, "*shavlulita*". The contention that the Sages of the Talmud held the *chilazon* in their hands, and did not use the word snail for it, but chose to call it a fish, is completely untenable.

On page 17, Dr. Singer discusses the meaning of the word "*potze'a*", and he accepts Rabbi Herzog's understanding that

there is a connotation in *potze'a* of cracking a hard shell. Sad to say, Rabbi Herzog was inexplicably mistaken in this understanding. In both biblical and mishnaic usage, *potze'a* carries no connotation of a hard object. One of numerous such examples is the Mishnah *Ketubot* 43b, "*Patza'a Bifaneha*", "he wounded her face." According to Radak's *Sefer Hasharoshim*, *Potze'a* refers to incising a smooth surface, splitting, cutting, wounding, or causing a fissure. See also Rashi, *Shemot* 21:25 and *Shir Hashirim* 5:7. It is the usage of "splitting" that is found in *Shabbat* 122b, "*Liftzo'a Egozim*", to split, not to crack, nuts.

A small experiment demonstrates why the Gemara there speaks of using a *kurnos*, a blacksmith's hammer, for opening nuts. When a walnut is struck smartly with a light 1/4 lb. hammer along the seam where the halves join, the shell at the contact point is crushed. But when it is merely tapped with a heavy 1 1/4 lb. hammer, it splits in half all the way around.

In other places *potze'a* is used for splitting the limbs from a tree or splitting a stretched string.

On page 19, Dr. Singer discussed the color of the "blood". The murex mucus is not blood, neither biologically nor in color. P'til advocates attempt to cope with this problem by writing the word thus, "blood". The implication here is that the "ancients" were imprecise in their use of language. However, there happen to be excellent words used in the Talmud for mucus: *Rir*, *Leicha*, and *Maya* are some of them.

On page 22, Dr. Singer quotes Dr. Ziderman that it is absurd to think that non-Jews would use murex dye, when indigo was available. In this reasoning Dr. Ziderman was already preceeded in the responsa of the Radbaz. But the most trenchant proof is from the prophet Yechezkel, who informs us in chapter 27 verse 7 that in the sixth century B.C.E., at the height of Tyrean commercial hegemony over the Mediterranean Basin, Tyre was importing, not manufacturing *techelet*.

On page 27, Dr. Singer writes of the silence of the Gemara about the murex. The *Beit Halevi* of Brisk, quoted in the forward to *Ein Hatechelet* page 13, rejected the Radzyner's *techelet* based on a most penetrating question. He asked, how is it possible that the *mesorah* (tradition) could have been lost, that this commonly available squid is in fact the fabulous *chilazon*? And since it is common, the *Beit Halevi* continued, then there is a *mesorah* that the squid is not the *chilazon*!

Tyrean dye faces even more severe objections, since it was massively produced throughout the Middle East, and continued to be produced in Constantinople until May 29, 1453. Beside the omission from the Talmud, there is not one hint by Rashi, the Rambam, or any other *Rishon*, that Tyrean purple manufactured in the sunlight was actually the much sought-after *techelet*. The proposition that the sages of the Talmud and the *Rishonim* were ignorant of facts on a subject of deep concern to them, facts that were commonly known in the world around them, is a proposition that is impossible to accept.

In note 11, Dr. Singer pronounces P'til Techelet's efforts as "inspiring". I find their efforts rather distressing. P'til is attempting to foist on an unexpert public a halachic practice through marketing methods and thereby establish the precedent of a *Minhag*. At the same time, their stand ignores the words of the *Rishonim* and exhibits a cavalier attitude towards the Gemara itself. The Gemara *Menachot* that gives the description of the *chilazon* is dismissed by P'til as "homiletic". If P'til succeeds, they will have contaminated the halachic process.

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