

Amutat P'Til Tekhelet is a non-profit organization based in Israel, comprised of a small group of individuals who devote their time to obtaining the snails that produce the *Tekhelet* dye, extracting the dye, and dyeing quantities of fine quality Merino wool. All their work is done by hand and *lishma* – for the expressed purpose of making *tsitsit*.



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# *The Meaning of Tekhelet*

Baruch Sterman



**P'Til Tekhelet**

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***Tekhelet*, the ancient biblical blue dye which adorned the robes of kings, priests, and simple Jews, was lost to the world nearly 1300 years ago. Recent advances in the fields of archeology, marine biology and chemistry in conjunction with intense examination of historical and talmudic sources have identified the source of the dye as the snail *Murex trunculus*. The *mitsva* (Commandment) to wear a thread of *tekhelet* is once again being fulfilled by Jews.**

**This article recounts the rediscovery of *tekhelet* and examines the meaning of the *mitsva* of *tekhelet* in *tsitsit* (ritual fringes), its purpose and significance, according to various commentators and scholars.**

## ***Background***

In ancient times, the coastal region of northern Israel and Lebanon was known for its dyes. The names Canaan and Phoenicia come from the words for dye merchant and shell-fish dye.<sup>1</sup> The Midrash (hermeneutic literature) notes that when Jacob tells his sons to bring gifts to the viceroy of Egypt "from the best of the land" (Genesis 43:11) he is referring among other things to the *hillazon*, the marine source of the blue dye *tekhelet*.<sup>2</sup> Throughout the ancient world, royal blue and Tyrian purple (*tekhelet* and *argaman*) adorned the robes of kings, princes, and priests. In Israel as well, *tekhelet* was used in the garments of the high priest and in the cloths, curtains and coverings in the Tabernacle. Every Jewish man wore a thread of *tekhelet* on the corners of his apparel to remind him of his stature and responsibilities.

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<sup>1</sup> M.C. Astour, "The Origin of the Terms Canaan, Phoenician and Purple" in *Journal of Near Eastern Studies*, Volume 24, 1965, pages 346-350.

<sup>2</sup> Genesis Rabba 91:11.

The blue and purple dyes obtained from the glands of snails found in the Mediterranean were the most precious commodities in this region. Wool dyed with *tekhelet* was worth up to twenty times its weight in gold,<sup>3</sup> and wars were waged to determine who would control this lucrative industry. Conquerors of Israel from Sisera to Nebuchadnezzar, from the Persians to the Romans, sought to dominate the dye trade. In the fourth century CE, private dealing in *tekhelet* or even wearing it were deemed capital offenses.<sup>4</sup>

Jews continued to wear *tekhelet* at great expense and sacrifice. The Talmud recounts the dangers of commerce in *tekhelet* in the story of two students who were caught by the eagle (a metaphor for Rome) smuggling *tekhelet* and miraculously escaped death.<sup>5</sup> The price of *tekhelet* was prohibitive, and it was scarce to the point that the Talmud was sympathetic towards one who could not obtain it; "the punishment for [not wearing] white [*tsitsit*] is greater than the punishment for not wearing *tekhelet*."<sup>6</sup>

*Tekhelet* was still exported from Israel to Babylonia at the end of the sixth century CE,<sup>7</sup> but by the middle of the eighth century the Midrash laments, "and now we have no *tekhelet*, but only white, for *tekhelet* has been hidden."<sup>8</sup> The loss of *tekhelet* in the seventh century coincides with the tremendous upheaval of the Jewish community in Israel at that time. The Arab conquest in 638 ended twenty years of war in the region, during which the Jews were massacred by the various factions. The Geonim, in fact, would not rely on the customs of the Jews of the Land of Israel, since their tortured history could not allow for reliable conveyance of tradition. It should come as no surprise that the traditions and secrets of the *tekhelet* dyeing could not survive the turmoil of that period. Not only was the Jewish dye industry destroyed, but the association of the snail-dye industry with the Roman occupation gave political significance to its extirpation by the invading Arab forces. Within a few centu-

ries, the art of procuring dyes from snails was lost to the entire Western world.

### **Descriptions of Tekhelet and the Hillazon**

Jewish sources have maintained a tradition as to the nature of *tekhelet* and its marine source, the *hillazon*. Though there is some confusion as to the precise hue of the dye,<sup>9</sup> one authority's charming, if not totally convincing, proof deserves mention: "the simple tradition in all of Israel has been preserved in all of the oral and written interpretations in teaching school children...*tekhelet*—sky blue."<sup>10</sup> This identification can be borne out in a more rigorous fashion. The Talmud in numerous places notes that *tekhelet* is similar to the sky (or sea).<sup>11</sup> The Septuagint, the oldest translation of the Torah, renders *tekhelet* as *iakinthos* - blue. The Babylonian sage Saadia (born 882 CE) translates it as *asma'ngon* (like the color of the clear sky)<sup>12</sup>, and Maimonides (born 1135) states, "it is the color of the clear sky visible near the sun."<sup>13</sup>

The Talmud relates that due to the extreme scarcity of *tekhelet*, avaricious individuals introduced a counterfeit dye, *kala ilan*, obtained from a much cheaper vegetable source. This fraudulent imitation provides the most direct demonstration of *tekhelet*'s color. The Talmud states that it was absolutely impossible to outwardly distinguish between true *tekhelet* and *kala ilan*<sup>14</sup>—consistently identified as indigo<sup>15</sup>—which is the color of a clear sky.

<sup>9</sup> Some of the confusion may come from differences in color designation between modern and classical terminology. For example, Rashi on Exodus 25:4 writes regarding *tekhelet*, "and its color is green," while on Numbers 15:41 he comments, "and so the color of *tekhelet* resembles the color of the darkened sky at dusk."

<sup>10</sup> *Kol Kitvey Rav Hertzog, Orah Hayyim* article 8, page 59.

<sup>11</sup> Babylonian Talmud *Menahot* 43b, *Hullin* 89a, *Sota* 17a; Jerusalem Talmud *Brakhot*, chapter 1, *halakha* 2; *Sifre Bamidbar* 15-38; Midrash Rabba Numbers *Naso* 14:3; Midrash Rabba Numbers *Shlah* 17:5; Midrash Psalms 24:9 and 90:10; and *Yalkut Shimoni* on Psalm 90.

<sup>12</sup> Kapah's version, Exodus 25:4, page 71, note 2.

<sup>13</sup> *Mishneh Torah, Laws of Tsitsit* 2:1.

<sup>14</sup> Talmud *Bava Metsia* 61, "The Holy One Blessed Be He said: I have distinguished between the drop of [semen that was to become] a firstborn and that of a non-firstborn. I will exact retribution from him who attaches *kala ilan* to his cloth and claims it is *tekhelet*."

<sup>15</sup> *Arukh Dictionary* on the word *kala ilan*; *Mishneh Torah, Laws of Tsitsit* 2:1 and Kapah commentary; Hertzog, *The Royal Purple*, page 94-96.

<sup>3</sup> W. Born, *Ciba Review*, Volume 1, 1937 pages 106-111 and 124-128.

<sup>4</sup> J.T. Baker, "Tyrian Purple: An Ancient Dye, a Modern Problem" in *Endeavour*, Volume 33, 1974, pages 11-17.

<sup>5</sup> Talmud *Sanhedrin* 12a.

<sup>6</sup> Talmud *Menahot* 43b.

<sup>7</sup> Rabbi Herzog quotes the Jerusalem Talmud *Tagnit* 43b.

<sup>8</sup> Midrash *Tanhuma* and Midrash Rabba Numbers *Shlah*.

Perhaps the most important characteristic of the *tekhelet* dye was that it was colorfast. Maimonides writes that "its dyeing is well known for its steadfast beauty and does not change."<sup>16</sup>

Jewish tradition has also described the source of the *tekhelet*—the marine organism called the *hillazon*. One must be careful not to interpret "all references to the *hillazon* as applying exclusively to the *tekhelet hillazon*."<sup>17</sup> Indeed, *hillazon* in modern Hebrew is used to describe all kinds of snails, both land and sea species. Nevertheless, a portrait of the *tekhelet*-producing *hillazon* can be reliably drawn.

The *hillazon* was found along the northern coast of Israel,<sup>18</sup> it had a shell,<sup>19</sup> and the dye had to be taken from it while it was still alive.<sup>20</sup> Its color was similar to the sea,<sup>21</sup> it "came up" periodically,<sup>22</sup> and its form of creation was similar to that of a fish.<sup>23</sup> One important source quotes the Jerusalem Talmud as translating *tekhelet* by the word *porphiron*,<sup>24</sup> which was the Greek and Latin name for snails of the genus *Murex*.

Moreover, the ancient secular scholars write about purple and blue dyes in great detail. Pliny<sup>25</sup> and Aristotle<sup>26</sup> describe the snails, how and where to find them, and the procedure for dyeing with them. Vitruvius mentions that there is a connection between the varied colors (purple through blue) obtainable from the snails and differing degrees of sunlight to which they are exposed. "For it does not yield the same color everywhere, but is modified naturally by the course of the sun.... As we proceed

between the north and west it becomes a leaden blue."<sup>27</sup> Scholars have positively identified these shells (*purpurae* and *bucinae* in Pliny's terminology) with the mollusks *Murex trunculus*, *Murex brandaris*, and *Thais haemastoma*.

### The Search for Tekhelet

During the mid-nineteenth century, the issue of *tekhelet* began to surface among Jewish writers. (It should be noted that the secular research on this topic was as yet unknown to the rabbinic community.) Along with the renewed Messianic interest and questions regarding the rebuilding of the Temple, the problem of how to make the clothes of the priests without *tekhelet* became manifest. Rabbi Barukh Isaac Lipshuets suggests that for the priestly garments, *tekhelet* from the authentic *hillazon* was not essential, but rather any dye which was of the correct color and had permanent qualities could be considered *tekhelet*.<sup>28</sup> The great *hasidic* Rebbe, Rabbi Gershon Henokh Leiner of Radzyn, did not accept this opinion, and, faced with the obstacle that the lack of *tekhelet* posed for the rebuilding of the Temple, resolved to take it upon himself to find the long lost *hillazon*. Rabbi Leiner wrote a short monograph, *Sfunei Tmunei Hol*, presenting his plan of action and offering a general preliminary discussion on the issues regarding the *hillazon*. He had heard the suggestion that a type of squid, *Sepia officinalis*, fit the description of the animal, and in 1887 set off to the great aquarium in Naples to study the matter first hand. He became convinced that *Sepia* could indeed be identified with the source of *tekhelet*, but was unable to procure a blue dye from the squid's black liquid excretion. Herzog suggests that the Radzyner Rebbe consulted with local chemists who showed him how to transform the black ink to blue. With this recipe in hand, Rabbi Leiner returned to Radzyn, opened up a dye factory, and within a year 10,000 of his followers were wearing blue strings on their garments.

The new *tekhelet* was not widely accepted by the general rabbinic world. The Radzyner wrote two more books, *Ptil Tekhelet* and *Eyn Ha'Tekhelet*, to explain his ideas and to counter opposition from other rabbis. These books still stand as the de-

<sup>16</sup> Mishneh Torah, Laws of *Tsitsit* 2:1.

<sup>17</sup> Herzog, *The Royal Purple*, page 60.

<sup>18</sup> Talmud *Shabbat* 26a, "Between the ladders of Tyre and Haifa." See also Talmud *Megilla* 6a. In his book *Ha'Tekhelet* (Jerusalem: Keter Publishing House, 1987) on page 29, footnote 22, Rabbi Borstein discusses the problem regarding the exact demarcation of the portion of Israel belonging to Zebulun.

<sup>19</sup> Mishna Rabba Deuteronomy, paragraph 67:11; Talmud *Shabbat* 75a.

<sup>20</sup> *ibid.* and Rashi *ad loc.*

<sup>21</sup> Talmud *Menahot* 44a.

<sup>22</sup> Once in 70 years (Talmud *Menahot* 44a) or once in 7 years (*Masekhet Tsitsit*, halakha 21). See Borstein, page 38, footnotes 76 and 77. Also *Kol Kitvey Hertsog*, page 52.

<sup>23</sup> The Vilna Gaon claims that the Rabbis term anything in the sea "fish." (Eliyahu Rabba, *Kelim* 10:1).

<sup>24</sup> "And we learn in the Jerusalem Talmud, between *tekhelet* and *karti*—between *porphyra* and *prifinin*. It is a garment that is called *porphyra* in other languages." (Ra'avya commentary on *Brakhot* 9a, *siman* 25.

<sup>25</sup> Pliny the Elder, *Natural History*, Book 9, LX-LXV.

<sup>26</sup> Aristotle, *De Animalibus Historia*, page 175.

<sup>27</sup> Vitruvius, *De Architectura*, *Libra VII*, chapter 13.

<sup>28</sup> *Kupat Ha'Rokhlim*, found in the Tiferet Yisrael's introduction to the order of *Moed*.

finite works on the subject and form the legalistic foundation for any discussion on the topic.

Meanwhile, the secular world continued to search for the ancient dyes as well. The apocryphal story of the rediscovery of the ancient dye snails has the French zoologist Henri de Lacaze-Duthiers sailing from the Minorcan port of Mahon in 1858, where he noticed a fisherman painting yellow streaks on his shirt with the juice of a snail he had broken open. The stains soon turned red in the sunlight, and the scientist realized that the shellfish, *Thais haemastoma*, was the source of the ancient Tyrian purple.<sup>29</sup> Lacaze-Duthiers' subsequent work identified three mollusks in the Mediterranean which produced dye material, *Murex brandaris*, *Thais haemastoma*, and *Murex trunculus*.<sup>30</sup> In 1909, the German chemist Paul Friedländer identified the chemical structure of the purple dye to be dibromindigo, and later work by him and others showed that this compound was a major component of the Mediterranean species as well as of mollusks in other parts of the world.<sup>31</sup>

Back in the Jewish world, in 1913, Rabbi Isaac Herzog, then Chief Rabbi of Dublin and later the first Chief Rabbi of the State of Israel, as part of research towards his doctoral thesis, sent samples of the Radzyn *tekhelet* to leading chemists and dye experts in Germany, France and England for analysis. The results that he received were surprising. The experts determined that the blue dye of Radzyn was not organic in nature, but rather was the inorganic dye known as Prussian blue, or ferric ferrocyanide. Herzog refused to believe that the Radzyner Rebbe would have purposely misled his followers and wrote to the dye masters of Radzyn asking for their process. Upon investigation, the solution to the riddle became apparent. The Radzyn recipe called for heating the squid ink to very high temperatures and then for the addition of iron filings. Under these conditions the organic molecules break down and the constituent atoms of carbon and nitrogen recombine with the iron, yielding Prussian blue dye. The squid ink is not an essential component for this reaction; any organic substance could be substituted, since the structure of the molecule is irrelevant and only the elemental components are utilized. Herzog could not accept the notion that the talmudic requirement for a specific marine source, the

<sup>29</sup> Israel Zideman, *Chemistry in Britain*, Volume 22, 1986, page 419.

<sup>30</sup> Henri de Lacaze-Duthiers, *Ann. Sci. Nat., Zool. Biol. Anim.*, fourth series, Volume 12, pages 5-84.

<sup>31</sup> Paul Friedländer, *Ber. Dtsch. Chem. Ges.*, Volume 42, 1909, pages 767-770.

*hillazon*, could be based on such an indirect and vague relationship. He therefore concluded that the Radzyn *tekhelet* could not be considered authentic.<sup>32</sup>

(As an interesting side note of history, during World War Two, with the destruction of East European Jewry, the *tekhelet* factories of Radzyn were ruined and the process lost. When the survivors of Radzyn made their way to Israel after the war, they asked Rabbi Herzog for the correspondence between himself and the Radzyn dye makers, and through those letters reestablished a *tekhelet* industry in Israel which still exists to this day. Thus Herzog is responsible both for discrediting Radzyn's *tekhelet* and at the same time for rescuing their process from destruction.)

Herzog himself was unable to come to a definite conclusion regarding the *hillazon*. Virtually all of his doctorate deals with the snails from the genus *Murex*, showing how the consensus among the scientific community is that they (*trunculus* in particular) were the source of the *tekhelet* dye. "Of the species known to have been used by the Phoenicians in purple-dyeing, the one which furnishes a dye answering at least to some extent to the tradition of the *tekhelet* nuance is none other than the *Murex trunculus*."<sup>33</sup> Herzog shows conclusively that these mollusks were used in ancient times for dyeing blue, and he notes the difficulty with the contention that Jewish *tekhelet* came from some marine animal that was unknown to the ancient scholars, and has left no archeological evidence. Herzog admits that "it is very unlikely that the *tekhelet-hillazon* is not the snail called *Murex trunculus*, but though unlikely, it is still possible."<sup>34</sup>

Despite the overwhelming evidence, Rabbi Herzog was unable to categorically identify the *hillazon* with the *trunculus*, for a number of reasons. First, he felt that *trunculus* did not fit the Talmud's description of *domeh l'yam*—resembling the sea. In fact, however, Herzog had seen only specimens cleaned and polished. In that state, the shells are colored with brown and white bands. *Trunculus* shells found in the ocean, on the other hand, are covered by small organisms whose texture and color varies from place to place, but the same sea-fouling will be found on all the rocks and shells in each region. Sometimes the

<sup>32</sup> Herzog, *The Royal Purple*, 114-118; Herzog, *The Dyeing of Purple in Ancient Israel*, The Israel Malacological Society, page 13.

<sup>33</sup> Herzog, *The Royal Purple*, page 73.

<sup>34</sup> Herzog, *Ha'Tekhelet B'Yisrael* 5:1, in Borstein, page 421.

coating has a blue or green coloring, and this would fit the description "similar to the sea." Moreover, since the word *yam* in biblical and talmudic Hebrew also means "sea bed,"<sup>35</sup> perhaps the *hillazon* is being portrayed as similar to the surrounding seascape, which is a perfectly fitting representation of the *trunculus* in its natural habitat.<sup>36</sup>

Second, *trunculus* has no periodic cycle corresponding to seven or seventy years to satisfy the talmudic description of "coming up" at such times. Herzog admits that "Science knows nothing of such a septuagenarian 'appearance' of any of the denizens of the sea."<sup>37</sup> Maimonides also does not mention the periodic appearance of the *hillazon*, which has led commentators to conclude that he did not consider this an essential characteristic of the animal. Indeed both Rabbi Herzog<sup>38</sup> and the Radzyner Rebbe<sup>39</sup> deal with this particular criterion of the *hillazon*. They raise the possibility that the cycle refers to periods of greater or lesser availability or accessibility, but that the animal itself is always obtainable.

Third, Herzog was under the impression that the dye obtained from the *trunculus* was not a steadfast one. Modern dye experts disagree with this and contend that both indigo and dibromoindigo do indeed bind tightly to wool and are among the fastest natural dyes. Though indigo is not known to be a particularly enduring dye, this is true only of cotton dyed indigo. Both dibromoindigo (purple) and indigo, however, bind very tightly to wool and will neither rub out nor fade over time. Professor Otto Elsner of the Shenkar College of Fibers in Israel,<sup>40</sup> a leading dye expert, has asserted that these dyes were among the fastest dyes available to the ancient world. Our own experience has shown that strings dyed with *trunculus* blue have maintained their color through daily wear and periodical washing for more than ten years.

The fourth, and most substantial, problem that Herzog had with *trunculus* was that the dye obtained from that snail produced a blue-violet color, and not the sky-blue hue that Herzog maintained was required for *tekhelet*. This issue was really the core of his difficulty in identifying the *hillazon* with the *truncu-*

*lus*. If in fact *tekhelet* can not halakhically contain any tinge of violet, then clearly the Murex whose dye does contain violet (as far as Herzog had observed) could not be the *hillazon*.<sup>41</sup>

Herzog proposed another candidate for the *hillazon*—the snail *Janthina*. Though he had never dyed with that snail, the fact that the shell had a blue color fit the description of being similar to the sea. Modern research, however, has shown that *Janthina* could not have been used in any dyeing industry. It lives in floating colonies, washes up on the shores of the Mediterranean after storms, either dead or dying, and is scarce to the point of being unavailable. Moreover, it does not produce a dye that can be used to color cloth. It does secrete a blue liquid, but that fluid turns brown after a few minutes and is water soluble. Chemists have so far found no way to use the secretion as a viable fabric colorant.<sup>42</sup>

### **Tekhelet Rediscovered**

In the early 1980's while researching ancient dyeing techniques, Otto Elsner serendipitously discovered the secret of producing a pure blue color from the *trunculus* snail, thus solving Herzog's fourth and most compelling difficulty. Elsner noticed that wool dyed on cloudy days tended towards purple, while on sunny days the color was pure blue. Together with Ehud Spanier of Haifa University, he investigated the photochemical properties of the *trunculus* dye and found that when the dye is in a reduced state (a prerequisite for dyeing wool), exposure to ultra-violet light will transform the blue-purple colorant to unadulterated blue.

The enzyme purpurase, which turns the glandular secretions of the snails into the dye on exposure to air, is present in live snails but quickly decomposes upon the snail's death, so in order for the dye to form, the gland must be crushed soon after being taken from the live snail, (in accordance with the talmudic passage that the *tekhelet* is taken from the *hillazon* while still alive). In the *trunculus*, the purpurase reaction yields a mixture of dibromoindigo (purple) and indigo. The dye must be put into solution (usually accomplished by reducing the dye

<sup>35</sup> See for example Isaiah 11:9 "as the waters cover the *yam*."

<sup>36</sup> Eliyahu Tavger, *Klil Tekhelet* (Jerusalem: Hemed Press, 1993) page 226.

<sup>37</sup> Herzog, *The Royal Purple*, page 69.

<sup>38</sup> *Kol Kitvey Hertzog; Orah Hayyim* 7:50-52.

<sup>39</sup> Gershon Henokh Leiner, *Sfunei Tmunei Hol*, page 4.

<sup>40</sup> In a personal correspondence

<sup>41</sup> Herzog, *Ha Tekhelet B'Yisrael*, chapter 11, "Is the Murex Trunculus the *Hillazon* of Tekhelet?", found in Borstein, page 224.

<sup>42</sup> H.K. Miemis and E. Spanier, "A Review of the Family *Janthinidae* (Mollusca, Gastropoda) in connection with the Tekhelet Dye" in *The Royal Purple*, page 197. This assertion has also been confirmed in personal correspondence with the late Otto Elsner.

molecule) in order for it to bind tightly to wool. In this state, if dibromindigo is exposed to ultraviolet light, the bromine bonds will be broken and it will transform to indigo, turning the *trunculus* colorant from purplish-blue to pure blue.

It should be noted that the blue dye obtained from Murex *trunculus* is molecularly equivalent to indigo, the Talmud's counterfeit *kala ilan*. If *trunculus* dye may not be used for *tekhelet*, then, as Herzog argues, the Talmud would have had to assert that not only is *kala ilan* unacceptable, but even *tekhelet* obtained from some marine animals—namely the Murex—is also unsuitable for the *mitsva*, since the two dyes (*kala ilan* and murex blue) are equivalent.<sup>43</sup> The fact that the Talmud never mentions any dye unsuitable for *tekhelet*, other than *kala ilan*, proves that the dye obtained from the Murex is acceptable for the *mitsva* of *tekhelet*.

Elsner's work was first brought to the attention of the halakhic community by Dr. Israel Ziderman. In 1985, Rabbi Eliahu Tavger of Jerusalem began researching a book on the subject of *tsitsit*. He became convinced that the true *tekhelet*—from the *trunculus*—had been discovered. He was determined to actualize his newfound knowledge and, after much trial and error, Tavger succeeded in applying the process according to the details of halakha from beginning to end. A few years later, Joel Guberman, Ari Greenspan and I joined with Rabbi Tavger in an effort to provide *tekhelet* to the general public. In 1993, we established the non-profit *Ptil Tekhelet* Foundation to produce *tekhelet* strings and promote research and educational projects. At present, thousands of Jews from various communities the world over are wearing *tekhelet* obtained from the true *hillazon*, the Murex *trunculus*.

<sup>43</sup> Herzog, *The Royal Purple*, page 73. Rabbi Herzog finds this proof for the identification of the *hillazon* with *trunculus* irrefutable, but for one possible loophole. "Should the dye of the *Janthina* prove to be faster than that of the *Murex trunculus*... then the tests [recorded in the Talmud] might well distinguish *Tekhelet* dyed with *Janthina* from that dyed with *M. trunculus*." Subsequent research done on *Janthina* has shown that not only is that dye not fast, but it is in fact not even a dye. The pigment is water soluble, does not bind to the wool, does not color the wool homogeneously, and stains the fabric brown and not blue. (See the article by H.K. Mienis and E. Spanier, "A review of the Family *Janthinidae* (*Mollusca*, *Gastropoda*) in Connection with the *Tekhelet* Dye," *The Royal Purple*, page 197.) With this loophole eliminated, Rabbi Herzog's original argument remains conclusive. In fact, the Radzyner Rebbe anticipated this argument. See *Sfunei Tmunei Hol*, page 19.

## The Meaning of Tekhelet

The Torah passage read daily in the *kriyat shema* describes the Commandment to wear *tsitsit*: (Numbers 15: 37-40):

And the L-rd spoke to Moshe, saying, Speak to the children of Israel, and tell them to make for themselves fringes in the corners of their garments throughout the generations, and to attach a thread of *tekhelet* on the fringe of each corner. They shall be to you as *tsitsit*, and you shall look upon them and remember all the Commandments of the L-rd and fulfill them, and you will not follow after your heart and after your eyes by which you go astray—so that you may remember and fulfill all My Commandments and be holy to your G-d (Numbers 15: 37-40).

## Numerical Associations

The mechanism by which one looks at the *tsitsit* and remembers all the Commandments in the Torah is the subject of dispute among the commentators. Rashi quotes the *Tanhuma* and explains that the association is brought about by *gematria*.

The numerical value of [the word] *tsitsit* is 600, and 8 strings and 5 knots equals 613. (Rashi on Numbers 15: 39)

There are 613 Commandments in the Torah, and by looking at the *tsitsit* one can be reminded of this number, which in turn reminds one of the Commandments themselves. Nachmanides does not accept Rashi's explanation. He points out that the word *tsitsit* (צִיצִית) is spelled without the first *yud* in the Torah, and therefore its numerical equivalent is actually 590. Furthermore, the number of strings is not agreed upon by the Talmud Sages, with Bet Hillel actually asserting that there be six strings, not eight. Also, the minimum number of knots is only two.

Beside the points that Nachmanides raises, there is also a grammatical difficulty with Rashi's understanding. The word *oto* (אָתּוֹ - and you shall see it) is masculine. *Tsitsit* is feminine, and as such can not be the object to which the *it* refers. The only masculine object to which the Torah passage can be referring is the *ptil tekhelet*, the thread of *tekhelet*.

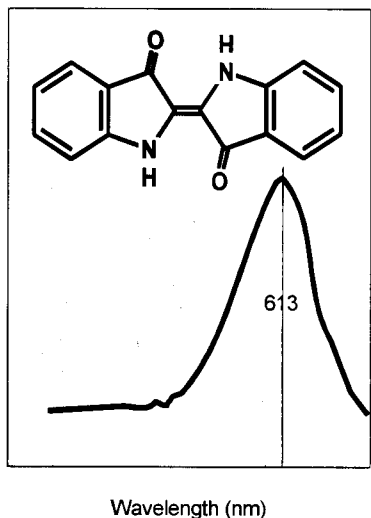
## The Color of Tekhelet

Nachmanides offers an alternative explanation for how the thread of *tekhelet* reminds one of all the Commandments.

Rather the remembrance is through the thread of *tekhelet*... For the *tekhelet* is similar to the sea and the sea is similar to the sky and the sky is similar to G-d's holy throne (Nachmanides on Numbers 15: 38).

Nachmanides' understanding is based on the color of *tekhelet*. Its depth of color, similar to the seemingly endless sea and sky, reminds the Jew of the Infinite, which brings him to remember all of G-d's Commandments.

These two interpretations, one based on the numerical value of 613 and the other on the symbolic significance of the color, are bridged by a fascinating scientific fact. Our eye perceives color in a complex fashion based on the various wavelengths that strike it. The color of an object is determined by the wavelengths of light that the object emits or reflects. White light, or sunlight, is made up of all the colors in the spectrum. When that broad-band light strikes an object, some of the wavelengths are absorbed and some are reflected, giving the object its characteristic color. For example, the element gold absorbs blue light and reflects the rest. When our eye sees all the reflected colors of the spectrum with the blue missing, it perceives the color as gold. Ultimately, the color we see is completely determined by which colors an object absorbs and which colors are reflected. No two substances have exactly the same color, since no two molecules absorb exactly the same wavelengths of light. The precise measurement of which wavelengths (usually given in units of nanometers—nm) a molecule absorbs



**Figure 1:** A molecule of *tekhelet* dye obtained from *Murex trunculus* gets its color from a strong absorption peak centered at exactly 613 nanometers.

(its absorption spectrum) is like a fingerprint, a unique way of identifying it.

J. Wouters and A. Verhecken<sup>44</sup> studied the properties of different dye molecules obtained from the *Murex trunculus* snail. They discovered that the *tekhelet* molecule (indigotin) gets its color from a strong absorption peak centered at exactly 613 nanometers.

## Priestly and Royal Garb

Another way of understanding the *mitsva* of *tekhelet* is based on the association of *tekhelet* in *tsitsit* with the *tekhelet* found in the priestly garments. Professor Jacob Milgrom notes that *tekhelet* was part of the priests' clothes and is found in conjunction with the Temple and associated with royalty as well. The priestly garments were also made of wool and linen, a combination usually prohibited in the Torah as *shaatnez*. The *tsitsit* may also be made of wool and linen and have a thread of *tekhelet*. Milgrom explains,

...*Tsitsit* is the epitome of the democratic thrust within Judaism which equalizes not by leveling but by elevating: all of Israel is enjoined to become a nation of priests. In antiquity, the *tsitsit* (and the hem) was the insignia of authority, high breeding and nobility. By adding the blue woolen cord to the *tsitsit*, the Torah combined nobility with priesthood: Israel is not to rule man but to serve G-d. Furthermore, *tsitsit* is not restricted to Israel's leaders, be they kings, rabbis or scholars. It is the uniform of all Israel...<sup>45</sup>

The thread of *tekhelet* was the simple Jew's priestly garb, reminding him that he was indeed a priest and that his responsibilities as such were to keep the Commandments of the Torah. "Now therefore, if you will obey My voice indeed, and keep My covenant, then you shall be My own treasure from among all peoples: for all the earth is Mine: and you shall be to Me a kingdom of priests, and a holy nation" (Exodus 19:6).

<sup>44</sup> J. Wouters and A. Verhecken, *JSDC* Volume 107, July/August, 1991.

<sup>45</sup> Jacob Milgrom, "The Tassel and the Tallit," The Fourth Annual Rabbi Louis Fineberg Memorial Lecture (University of Cincinnati, 1981).



In fact, the association of the thread of *tekhelet* with the priests' clothes through *shaatnez* is already alluded to in the Talmud.

"Everyone is obligated to wear *tsitsit*: priests, levites, and Israelites." This is obvious, for if priests, levites and Israelites are not obligated, then who is obligated?! [This phrase] is needed [to teach that] priests [are obligated]. One might think that since it is written (Deuteronomy 22:11-12) "Thou shalt not wear a garment of diverse kinds (*shaatnez*), of wool and linen together: Thou shalt make fringes...", one for whom *kelayim* [*shaatnez*] is not permitted on his garments – he is obligated in *tsitsit*, but priests who are permitted to wear *kelayim* should not be obligated [to wear *tsitsit*]. This [the above passage] teaches, that though they are permitted [to wear *shaatnez*] at the time of their service, when it is not the time of their service they are not permitted.<sup>46</sup>

The implication of this passage is that indeed, at the time of their service, priests were not obligated to wear *tsitsit*. This can be understood if we view the thread of *tekhelet* as the ordinary Jew's lower level equivalent of the priestly garb. When the priest is wearing his uniform, which is certainly a higher level of priestly attire, he is not required to wear the lesser habit. But when he takes off his special robes, he is once again required to wear the special dress of all Jews, the *tsitsit*.

The notion that the *tekhelet* reminds one of nobility is also found in the Talmud:

We learned, Rabbi Meir used to say: Greater is the punishment for [not wearing] white [strings of *tsitsit*] than the punishment for [not wearing] *tekhelet*. To what may this be compared? To a human king who speaks to two servants; to one he says, 'bring me a seal of clay' and to the other he says, 'bring me a seal of gold,' and both transgressed and did not bring them. Towards which should the punishment be greater? One should say, the one who was charged with obtaining a seal of clay, and did not bring it.<sup>47</sup>

<sup>46</sup> Talmud Menahot 43a.

<sup>47</sup> ibid 43b.

In this passage, the Talmud implies that there are two aspects to *tsitsit*, the white and the *tekhelet*. They both can be compared to a seal, the white to a seal of clay and the *tekhelet* to a seal of gold. A seal serves as a reminder. Perhaps the Talmud here is implying that on the one hand, the *tsitsit* is a seal reminding us that we are slaves, bound by our commitment and responsibilities to follow our instructions and commandments. This aspect is the white in the *tsitsit*, the seal of clay. On the other hand, we are not just ordinary slaves, but servants of the King. Our seal is of gold, to remind us that those responsibilities are derived not from a lack of freedom, but from our being chosen to a high and lofty position, servants of the King of Kings. The Commandments are not a burden, but rather a privilege, that we may carry out G-d's charge and better the world over which He reigns.<sup>48</sup>

### **The Symbolism of White and Blue**

A number of suggestions have been proposed regarding the symbolic interpretation of the white and blue threads on the *tsitsit*. The Zohar, for example, associates white with the Divine attribute of compassion, and *tekhelet* with that of justice, and compares *tekhelet* to the inside of a flame.<sup>49</sup> The *Hinukh* identifies white with the physical and *tekhelet* with the spiritual.<sup>50</sup>

One of the most beautiful interpretations is that of Rabbi J.B. Soloveitchik.<sup>51</sup> The Rav notes that white is often associated with the notion of clarity, of comprehension based on straightforward logic. The phrase, *hadvarim melubanim* (the subject is white), is an idiom expressing that an obvious point is self-evident. White signifies an elementary truth, it denotes the rational in the universe.

*Tekhelet*, on the other hand, signifies the mysterious. It resembles the sky and sea which intimate distance and inapproachability, things that are beyond one's reach and out of one's control. It expresses infinity, boundlessness and vast-

<sup>48</sup> See Yehuda Rock, *Hidush Ha'Tekhelet V'Inyiney Tsitsit U'Tekhelet*, available from Ptil Tekhelet.

<sup>49</sup> Zohar, *Shlah* 195.

<sup>50</sup> Sefer Ha'*Hinukh*, mitva 386 (*Shlah*)

<sup>51</sup> This presentation is taken from a tape of Rabbi Soloveitchik and from the article "The Symbolism of Blue and White," in Abraham Besdin, *Man of Faith in the Modern World* (Ktav, 1989).

ness. *Tekhelet* suggests the irrational and mysterious side of the world.

The Jewish approach to the world, according to the Rav, has never been unified but is always ambivalent because the world around us displays two aspects. The first is rationality, the realm of cause and effect, of science which can place a man on the moon by means of mathematical calculations and computer programs based on logical reasoning. On the other hand, the world is often perplexing, as is man himself. The scientists who put a man on the moon are helpless to cure certain degenerative illnesses. Inorganic matter yields its secrets more generously than organic matter.

Rav Soloveitchik goes on to say that the dichotomy of rational versus irrational is found not only within the natural world, but within history and human perception as well. Everyone has experienced the *lavan*, the white, the rationality of the universe, and everyone has also been confronted with the incomprehensible, the mystery, the *tekhelet*. The blue and the white '*miqvin ze et ze*' [*tekhelet* and *lavan* are both required for *tsitsit*], they are interdependent.

If the Jewish approach to history had been rational, *lavan*, we would not be in Erets Yisrael now. To return to a land that was promised to us four thousand years ago involved the mysterious, irrational element of *tekhelet*. But in order for the Jew to maintain a twofold approach of *lavan* and *tekhelet*, the *tekhelet* must have the quality of permanence. We must display absolute, unqualified, unreserved devotion to the commitment we took upon ourselves four thousand years ago.

### Conclusion

The *mitsva* of *tekhelet* is the only one of the Commandments that we lost and now have the potential to reinstate. As such, it offers a singular opportunity to examine the nature of *mitsvot* in general and the relationship between law, tradition, and new-found information. Many Jewish thinkers are now grappling with these issues.

*Tekhelet* is also unique in that it is the only Commandment in the Torah which serves to remind us of all the other Commandments. In this way, by uncovering the secret of *tekhelet*, we can hope to better understand the character of the Commandments as a whole. In this respect, *tekhelet* is particularly suited to represent the entirety of the Torah since in the depth of the blue color one can gain a momentary glimpse of eternity.

וַיֹּאמֶר הוֹ אֵל מִשָּׁה לְאֹמֶר: דְּבַר אֵל  
בְּנֵי יִשְׂרָאֵל וְאָמַרְתָּ אֲלֵהֶם וְעָשׂוּ לָהֶם  
צִיצִית עַל כְּנֹפֵי בְּגָדֵיהֶם לְזֵרוֹתָם וּנְתָנוּ  
עַל צִיצִית הַכֶּנֶף פְּתִיל תְּכֵלֶת. וְהָיָה לָכֶם  
לְצִיצִית וּרְאִיתֶם אֹתוֹ וּזְכַרְתֶּם אֶת כָּל  
מִצְוֹת ה' וְעָשִׂיתֶם אֹתָם.

Numbers 15: 37-39