

Chemical Testability

R. Mois Navon, 5772 (original 5762)

Our Rabbi's taught [in a Braita]: There is no manner of testing tekhelet...But [the Amora] R. Issac bar R. Yehuda used to test it thus: he used to mix liquid alum, fenugreek juice, and urine of a forty day old child and soak the blue thread overnight until morning; if the color faded it is invalid. R. Adda stated...one should take a piece of hard leavened dough of barley meal and bake it with [the blue thread] inside; if the color improved it is valid, but if it deteriorated it is invalid...the statement "There is no manner of testing tekhelet" refers to the test sample.

(Menachot 42b-43a).

Though the Braita (Men. 42b) states that there is no manner of testing to determine if the tekhelet dye is of plant origin or of snail origin (in accord with empirical evidence)¹, the Gemara (Men. 42b-43a) does provide a chemical method of testing. The Gemara itself attempts to reconcile the contradiction stating that the import of the Braita is that there is no manner of testing whether it was dyed intentionally for tzitzit (i.e., whether the dye lot was from the test sample "ate'ima" or from the intended first dye run).

This conclusion requires explanation, for it implies that there was a chemical difference between indigo dye obtained from the plant versus that obtained from the snail. A number of solutions are offered:

- 1) There are other chemicals which accompany the indigo molecule from the snail which make it faster to wool than those which come from the plant source.²
- 2) At the time of the Tanaim (who authored the Braita which states there is no test) the two dyes were indeed identical and no test could distinguish between them. However, at the time of the Amoraim (who authored the Gemara which provides a test) the plant source was different than genuine kela ilan but was just referred to as such (since it was an alternate source of blue dye).³
- 3) The dye manufacturing process in the time of the Gemara was such that they added the actual snail during the reduction process, something which wasn't done during plant source dyeing and could have effected the fastness of the dye.⁴

In a new article (The BaDaD Journal, Vol. 27, 2012) entitled "Identifying Tekhelet: New findings",⁵ Dr. Roy Hoffman from the Institute of Chemistry at The Hebrew University of Jerusalem writes that the difference was based on the chemical processing (as in proposal 1 above). He surmises that due to the great expense involved in procuring the necessary chemicals to create a proper reduction vat, this process was reserved exclusively for the snail dye and not the plant dye. The plant dye could be done cheaply by simply grinding the indigo leaves and preparing a high concentration suspension in water. The resulting dyed wool would look identical to that from the snail based dye; it,

¹ The blue dye produced by the *Murex trunculus* is molecularly identical to that produced by the plant (kela ilan) – see Otto Elsner and Ehud Spanier, "The Past, Present and Future of Tekhelet", *The Royal Purple and The Biblical Blue* ed. Ehud Spanier (Israel: Keter, 1987), p.175.

² R. Y. Rock, "Hiddush Hatekhelet", p.17, sec. III (see: <http://tekhelet.com/pdf/rak.pdf>).

³ Ibid.

⁴ Dr. Sterman; acknowledged by Nobel Chemist Roald Hoffman, personal conversation.

⁵ See: <http://tekhelet.com/pdf/naturaldye-paper3.pdf>

however, would not be bonded well in the wool. Prof. Hoffman explains that the urine test mentioned in the Gemara describes the process for reducing the dye. If the dye was properly reduced when first dyed in the wool (as was the case for the snail based dye), the reduction will merely cause the dye to reduce again and when the wool is removed from the vat, the dye will oxidize back into the wool as it had upon original dyeing. That is, there will be no notable fading. However, if the dye was never properly reduced it will never have bonded well into the wool in the first place and thus, upon being reduced in the test vat it will not re-bond into the wool upon removal from the vat. Hence, the fading noted by the Gemara in the case of kela-ilan.

This appears to neatly resolve a long standing quandary regarding the Gemara's test, but whether or not one accepts this explanation, it should be clear that the proposed chemical test does not throw into question the validity of Murex tekhelet – for it clearly passes the test of remaining fast to the wool (i.e., “Lo Ipareid Hazutei”).