THE GEMS IN THE HIGH PRIEST'S BREASTPLATE: A PRAGMATIC REVIEW

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INTRODUCTION

Throughout history gemstones have been highly prized. The Tanakh is no exception in the appreciation of precious gems. One of the most remarkable artifacts described in the Bible is the Hoshen, the High Priests' breastplate, which prominently featured gemstones.

According to the detailed description in the book of Exodus 28:15-30, the breastplate had four rows of gems embedded in gold settings, with the names of the twelve tribes engraved on their surface. The breastplate was to be attached to the Ephod worn by the High Priest by gold chains held by gold rings on the shoulder straps. The gems contributed by the ancient Israelites in the wilderness were used in the Tabernacle as described in Ex. 28:17-22.

The identity of the gems has remained ambivalent throughout history. However, we may glean some physical characteristics which help remove at least some of the uncertainties. The hardness of the gems, their availability in the ancient Near East, and the probable size of the gems all can provide some clues to determine their identification.

SIZE AND VALUE

In the description of the breastplate the text specifies that the linen part, when folded, measured *a span in length and a span in width* (Ex. 28:16). A span is about 8-9 inches. Based on this, we can make a rough estimate that the maximum size of the gems was no more than 2x2 inches and probably even less, to allow for the gold setting and the decoration of the linen. It is not likely that in the period of the Tabernacle, Israelites recently escaping from Egypt would have been able to purchase precious gems such as sapphires, rubies and emeralds in these sizes. However, we read in Exodus (3:22, 12:35, 36) that the Israelites obtained precious items of gold and silver from

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their Egyptian neighbors which may have conceivably included some small gems.

HARDNESS AND ENGRAVING: THE MYSTERY OF SHAMIR

The description in Exodus specifies that the names of the twelve tribes were to be engraved in the gems in the breastplate. How could this be done with the available materials? This material had to be harder than the gems themselves. TB *Sotah* 48b states that the shamir was used for this purpose, described as a special worm that would pass over stones and they would be cut open. A less folkloric approach to the identification of shamir may be gleaned from the Prophets. The word *shamir* appears in three places in these books, Jeremiah 17:1, Ezekiel 3:9 and Zechariah 7:12. All three citations refer to a material of exceptional hardness. Zechariah refers to it in the context of a comparison, *They hardened their heart like shamir*. Ezekiel states *I will make your forehead like shamir, harder than flint*. In the citation by Jeremiah we have a reference to engraving *with a shamir point.* The JPS Tanakh consistently translates Shamir as "adamant", a general term used to describe a very hard substance.

Although Ezekiel indicates that shamir is harder than flint, in Aramaic shamir actually means "like a flint stone."[1] The similar Egyptian word asmer is translated as emery, an abrasive rock. Emery consists largely of the mineral corundum. Since flint pieces have been used as tools since the Stone Age, it would be a good option for the tool used to engrave the stones. The hardness of selected gems is illustrated in Table 1. If shamir is identified as emery, the engraving of all the names of the tribes would be possible except on a diamond.

IDENTIFICATION AND PROPERTIES OF THE GEMS

ODEM

The name of this stone implies only that it is a red mineral or rock. Several gems of this color could have been present at the time of the Tabernacle, such as garnet, red jasper, ruby or carnelian. The Greek word for it is *sardius*. The Septuagint, Josephus[2] and Epiphanius[3] all use *sardius* as a designation of the ancient carnelian. Carnelian has been found at several excavations in tombs

of ancient Egyptian royalty as early as 3100 BC and at later times.[4] It was used in Babylonian cylinders.[5] By composition, carnelian is an orange-red variety of quartz, less difficult to engrave than ruby. Therefore, by hardness, cost, availability and history of the word, Carnelian seems to be a probable identity.

PITDAH

The name of the gem seems to be derived from the Assyrian *hipindu* and the Sanskrit *pita*, meaning yellow.[6] Topazios is described in Pliny's writings as having a greenish and yellow hue,[7] it is possibly green chrysolite, often called olivine and peridot, which was a soft green MgFeSilicate. In Theophrastus' works we find "topaz of the ancients now called chrysolite."[8] However, topaz was not known in the time period the Book of Exodus was traditionally composed. On the other hand, peridot has been mined in Egypt since 3000 BCE, and also appears as part of some meteorites. It was available in the ancient Near East. Its color is a vivid green and transparent as opposed to topaz which is usually yellow and sometimes pale blue. Peridot seems a good option.

Saadia Gaon identified it as emerald, which is unlikely on account of its hardness and cost. The Septuagint identifies it as chalcedony, a form of quartz (SiO_2), which may assume several colors. Chalcedony was used as a gem as far back as 1800 BCE in Minoan Crete.

BAREKET

The name bareket may be derived from *barak* meaning lightning or flash. Among other locations it was found in Tyre (Ezek. 28:13), a country which had long standing trade relations with Judea. Josephus translates bareket as smaragdus, a well known gem, mined in the area of Nubia and used in the Graeco-Roman period. However, the word smaragdus can designate other green hued gems and some translations some even identify it as rock crystal, a colorless quartz, which is unlikely for a stone named for its brightness in Hebrew. Green feldspar which was used frequently in ancient Egypt for amulets, and green beryl which was used in 14-16 century BCE Egypt for carved statues are also options. However, since beryl or emerald would be extremely difficult to engrave, green feldspar is the better option.

NOPHEK

Josephus identified this as carbuncle, meaning glowing coal, an expression used for some gems with a brilliant reddish hue. There is considerable disagreement regarding this color. Philo of Alexandria agrees with Josephus that it is a red gem.[2] The Jerusalem Talmud favors the red color while the Babylonian Talmud is partial to a green gem.[9] *Exodus Rabbah* favors red while the Babylonian Targum favors the green color.[9] The word may have also derived from the Egyptian *mafeket*, which refers to malachite or turquoise, copper phosphates, of greenish blue color. Theophrastus considers it malachite.[8] The gem could possibly be garnet which is also red.

SAPPIR

The word is translated as sapphirus, but the description does not correspond to sapphire as we know it today. This gem was not known before the Roman time period and first appears in rabbinical works from that era.[10] Both Theophrastus[8] and Pliny[7] describe this mineral as a deep blue gem with gold spots. This characterization fits the gem lapis lazuli better than sapphire does. Lapis lazuli was called chesbet in ancient Egypt and was sent as a gift to the Pharaoh Akhnaten from Babylonia.[10] This gem has been mined in the Near East since 4000 BCE and was used to produce amulets, figurines and other artifacts. It was also used to produce the dye ultramarine.[4] Since lapis lazuli was esteemed in ancient Egypt and was still used as ornamental material into the Graeco-Roman period this would be a likely candidate for sappir.

YAHALOM

The identity of this gem is one of the most difficult. Ibn Ezra translated it as diamond, but suggests that it might have been white onyx. However, onyx was not mined before the Classical period of Greece.[4] From the economic point of view, diamonds have always been very costly. It is not likely that Israelites wandering in the desert would have a 2x2 inch piece of good quality diamond. Also, there is also no clear indication that diamonds were available in the ancient Near East. Cornelius van den Steen adds that since the diamond is so much more valuable than any of the other gems mentioned in the breastplate, using a diamond to represent any of the twelve tribes would have

induced envy and animosity.[11] Since diamond has the highest hardness, as shown in Table 1, no other materials would have been able to accomplish the engraving.

This gem could be onyx, for it was available at the time and engraved onyx was used for creating seals.

LESHEM

This is also difficult to identify. The discussion about the identity of this material among the ancient and modern authorities rely on etymology of the name rather than any properties. Ligurius,[10] was often translated as amber both by Theophrastus[8] and Dioscorides.[12] As amber is a fairly soft fossil (Hardness 1-3; Hardness of Baltic amber 2-2.5) this would be unusual for placement among the harder gems in the breastplate. Ligurius may have been the name of the place in Italy where the amber was found. Later texts identify ligurion as another gem, jacinth. Hyacinth is a variety of zircon which appears in different colors. Other minerals suggested were opal, rubellite or tourmaline. In Theophrastus'[8] work the gem may have been sapphire or jacinth. Theophrastus mentions that this mineral is very cold to the touch, which applies to sapphire or jacinth (hyacinthus). In Arabic terminology, the word implied a generic name for a corundum containing gem. Sapphire was engraved in the Roman time period, but was not known in ancient Egypt. Therefore, leshem could not have been sapphire in the Bible. Brugsch and Wendel suggested that the name may have been misspelled and was Neshem, which in Egyptian implies a yellowish or reddish brown hued agate, while *Numbers Rabbah* 2:7 states that it black. Although this is consistent with the metal antimony, it is unlikely that this metal would be used as a gem. This gem is probably a type of agate.

SHEVO

Ancient and modern authorities all are in agreement that this gem belongs to the agate family, a form of chalcedony, a type of quartz. The word agate is of Greek origin, associated with a river in Sicily where large quantities were mined as early as 3000 BCE. Josephus also calls it agate and Pliny (37:54) agrees.[2,7] This rock has been available since ancient times. There are many different agates in a variety of colors. Some are of solid color; others are

banded or otherwise patterned. *Numbers Rabbah* 2:7 calls it grey, and a grey-white variety was known to appear in Egyptian amulets. Theophrastus gave the first detailed description of agate in his work "Concerning stones."[8]

ACHLAMAH

The scholarly authorities agree that it is a purple gem and identify it with amethyst. However, this gem may have been the purple variant of quartz, now identified as fluorite. This gem was available in the ancient Near East. *Numbers Rabbah* 2:7 says that it had a red wine color.

TARSHISH

The name is most probably the name of a place (Gen. 10:4; I Kgs. 10:22; I Chron. 1:7, Psalms 48:7; Isa. 2:16; Jer. 10:9; Ezek. 27:13,25; Jonah 1:3,4:2) where the gem came from. In Aramaic Tarshish is Tartessus. According to several resources Tartessus was a Phoenician colony in the South of Spain. There was extensive trade relationship between Tartessus and Tyre, since the times of King David and King Solomon. Tartessus supplied silver, iron, tin and lead to Tyrian workshops and to King Hiram (Jer. 10:9, Ezek. 27:12,25).

The identity of the gem has been disputed. It has been identified as topaz, chrysolite or aquamarine. However, beryl is unlikely on account of its hardness. Stone of Tartessus was also thought to be Spanish cinnabar from Almaden, shipped from Tartessus, which is Mercuric sulfide. Jasper or serpentine of golden color were commonly used in Egypt and Babylonia. Symmachus renders it yakinthos meaning Jacinth.[13] The ancient Chrysolite was what we now designate as topaz and this is the most likely identity.

SHOHAM

This gem is referred to as one of the minerals in the land of Havilah, which according to Genesis 2:11,12 is the locality of the Garden of Eden. Beryl, Onyx and even the mysterious Bedolah are identified with Shoham. Josephus translates it as Onyx.[2] Even its color is ambiguous. Ibn Ezra says it is white, while the Midrash[9,10] calls it black. Ezekiel 28:13 states that it was a valuable gem in the Garden of Eden. Job 28:16, 17 describes it as a symbol of wealth and importance. We may surmise that Shoham was costly, rare and hard. As Onyx is a type of silica and can be found in many different colors, this is a

good candidate for its identity. Another option may have been malachite or turquoise which were known to have been mined in the Sinai Peninsula. These gems were highly valued and used in ancient Egypt.

YASHPHEH

According to Ezekiel 28:13 this is also one of the gems found in the locality of the Garden of Eden. Translators agree that it is the mineral Jasper, which is a variety of silica. An Assyrian form of the word is yashpu appears in the Tell-el-Amarna letters in cuneiform writing.[9,10] The talismanic and therapeutic qualities of green Jasper were highly praised. It also may have been nephrite or jadeite which have been known and used since prehistoric times. *Numbers Rabbah* 2:7 calls it a multicolored gem, while Josephus thought it was beryl.

CONCLUSION

As a critical scientist, I wish to begin my conclusions with some reservations and feeling of humility in working on this topic. There is no explicit continuity between the description of the gems by Josephus Flavius, Saadia Gaon, Ibn Ezra or later translators. We can make some intelligent guesses and attempt to remove some degree of uncertainty in view of their properties, value and geographic availability, but we cannot make explicit positive identifications. In ancient society, the gems were not classified by composition or crystal structures. These represent modern developments. Their names were often given by color, place of origin, prior use and folkloristic legends. Since the 1800s scientists have begun to identify gems by their chemical composition, physical characteristics and their crystal structures.

However, we do know that most of the gems discussed were considered precious in Egypt, Assyria and Babylonia.[10] During the period of the Tabernacle, Judean traders could have obtained gems from merchant caravans. As we obtain more information due to archaeological excavations and by studying the writings of ancient historians we may be able to make a more definite identification of these minerals.

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NOTES

1. P.Goldstein, Modern physics and the shamir., *B'or haTorah*, **10** (1997) 173-176.
2. Josephus Flavius, *Antiquities of the Jews* (Peabody, MA.: Hendrickson Publ., 1988), III,7/5; V,5/7; F. Kunz, *The Curious Lore of Precious Stones* (Philadelphia: J.B. Lippincott Co.: 1913), p. 275-306.
3. Epiphanus of Salamis was a bishop in Cyprus (4th century AD). He wrote the first treatise about gems in the Bible, "De gemmis", or Biblical Lapidary., P.G. Maxwell-Stuart, "Epiphanus on Gemstones", J. Gemology, 15(8) (1977) 435-444.
4. Immanuel Loew, *The Fauna and the Minerals of the Jews*, (A. Scheiber, Editor) Hidesheim: Georg Olms Verlagsbuchhandlung, Germany, 1969, pp222-226;251-259.
5. F. Kunz, *The Curious Lore of Precious Stones* (Philadelphia: J.B. Lippincott Co.: 1913), p. 275-306.
6. J.R.Partington, *Origins and development of Applied Chemistry.,* Longmans, Green and Co., London, 1933, pp 479-529.
7. Pliny the Elder, *Natural History*, III-VI, (Penguin Classics, 1991), xxxvii, 39.
8. E.R. Caley, J.F.C. Richards, *Theophrastus, On Stones*, Ohio State University Press, Columbus, OH. 1956, pp. 45-60;63-227.
9. *Encyclopedia Judaica*, under the heading Priestly Breastplate.
10. *Encyclopedia Judaica*, under the heading Precious stones and jewelry in the Bible.
11. Cornelius van den Steen was a Flemish Jesuit (1567-1637). He became a Professor at Leuven University, Belgium and wrote many treatises on scientific topics in the five books of Moses and in some of the books of the Prophets.
12. Dioscorides was a gem engraver in the time period of Emperor Augustus, Rock and Gem, 44(8) (2014)45.
13. Symmachus was a translator of the Bible to Greek and listed the precious stones in the Hoshen, (2nd century CE).

Table 1

Hardness of the minerals considered

Name	**Moh's hardness scale**
Talc	1
Gypsum	2
Calcite	3
Fluorite	4
Apatite	5
Feldspar	6
Quartz	7
Topaz	8
Corundum	9
Diamond	10
	Hardness of selected rocks and minerals
Flint	7
Emery	7-9
Corundum (Sapphire, Ruby)	9
Fluorite	4
Topaz	8

Quartz (Amethyst, Citrine, Agate, Chalcedony)	6.5-7
Peridot	6.5-7
Beryl (Emerald, Aquamarine)	8
Garnet	7.5
Carnelian	6.5-7
Chrysolite	8.5
Turquoise	5-6
Malachite	3.5-4

Table 2
Summary of probable gems in the High Priest's breastplate

Hebrew name	**Graeco- Roman name**	**Engraved name**	**Modern probability**
Odem	Sardius	Reuben	Carnelian
Pitdah	Topazios	Simeon	Peridot
Bareket	Smaragdos	Levi	Green feldspar
Nophek	Carbuncle	Judah	Turquoise Malachite
Sapir	Sapphiros	Issachar	Lapis lazuli

Yahalom	Beryllios, Onychion	Zebulon	Onyx
Leshem	Ligurios	Dan	Hyacynthos, Agate
Shevo	Achates	Gad-Naftali*	Chalcedony
Achlamah	Amethystos	Naphtali-Gad*	Fluorite
Tarshish	Chrysolitos	Asher	Chrysolite
Shocham	Beryllios, Onychion,	Joseph	Onyx
Yaspheh	Iaspis	Benjamin	Nephrite

*These two are inverted in some sources