

Implications of the “Forgery Trial” Verdict on the Authenticity of the James Ossuary

The James Ossuary was labeled a forged artifact in 2003 by the Israel Antiquities Authority. The “not guilty” verdict (case 482/04) by the Honorable Judge Aharon Farkash of the Jerusalem District Court in March, 2012 resulted in the acquittal of Oded Golan of charges that he forged the James Ossuary Inscription and the Jehoash inscription tablet. The “Forgery Trial” sparked a fruitful and important debate on the issue of unprovenanced artifacts by top scientists from all over the world. The conclusions of the Judge regarding the inscription of the James Ossuary contributed much to the forgery debate. By casting doubts on the accusations, the Judge accepted some crucial facts: 1- the inscription was cleaned by a sharp object; 2- there is a real patina covering some letters in the words “Achui d’Yeshua;” 3- statistically the few samples analyzed by the prosecution experts are not sufficient for conviction; 4- the oxygen isotope “expected range” cannot determine forgeries; 5- oxygen isotopic examination of patinas on artifacts is as yet not perfected and cannot be used to determine whether the artifact is authentic; 6- the photos of the ossuary from the 1970s presented to the court are authentic; 7- the casting of the red silicone by the IAA forensic examiners changed the physical condition of the inscription of the ossuary, so much so that Golan’s defense was affected adversely; 8- the judge accepted Professor Krumbein’s statement that “the patina on the ossuary evolved over centuries if not thousands of years, and that the patina within the inscription and the patina on the ossuary were created during the same time period;” 9- the IAA material committee’s conclusions were based on unverified climatic data, incorrect chemistry, ignoring the possible effects of the cleaning, conservation and enhancement of the inscription; 10- the Judge accepts that disqualifying the “Het” sample or other sample, based only on the outcome of its isotopic composition is a “scientific bias or a circular argument.” ;11- the ability of the experts from the Royal Ontario Museum, Canada, to distinguish between genuine and pseudo-patina was valid even though Professor Goren claimed otherwise; 12- the IAA material committee came to incorrect and misleading conclusions regarding the discovery of microfossils in the patina. Judge Aharon Farkash’s verdict in the alleged forgery of the James Ossuary inscription clearly contributes more than ever to the strengthening of the contention that the inscription is genuine.

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 April 2012

INTRODUCTION

The discovery in 2002 of a limestone burial box called ossuary with the Hebrew [Aramaic] inscription "James son of Joseph brother of Jesus" tantalized the world of archaeology. If genuine, the ossuary would be the only archaeological artifact yet found with a possible direct link to Jesus of Nazareth. The ossuary that was found in Israel went on display at Toronto's Royal Ontario Museum and swiftly thereafter ensued a scholarly debate resulting in many studies, several documentary movies and at least four books.

However, experts at the Israel Antiquities Authority (IAA) declared it a modern-day forgery. Israeli police seized the ossuary and arrested its owner, Tel Aviv collector Oded Golan. In December 2004 he was charged with faking the ossuary and dozens of other items, including an inscribed tablet linked to King Jehoash, which, if authentic, would be the only physical evidence from the Temple of Solomon.

This article is based on the testimony of expert witnesses who testified in the "Forgery Trial" and on the 475 pages of the meticulous verdict of the Judge Aharon Farkash, District (Criminal) Court in Jerusalem, Israel. The verdict was delivered on March 14th, 2012 (case number 482/04) the State of Israel (IAA) - versus Oded Golan and 4 others who were accused of forging very important antiquities. We discuss herein the scientific problems in lieu of the verdict concerning the James Ossuary inscription (JO; count # 1). The Jehoash inscription tablet (JI; count # 2) and the decorations of the stone oil lamp (count # 7) will be discussed in a later publication. The verdict in case 482/04 by Judge Farkash came about because proof was not presented in the court that the artifact was forged beyond a reasonable doubt. The prosecution experts could not agree among themselves about whether these artifacts are fakes. We have investigated, published and testified about these three artifacts (Ilani et al., 2002; Ilani et al., 2008; Krumbein, 2005; Rosenfeld and Feldman, 2008; Rosenfeld et al., 2009; Rosenfeld et al., 2010a,b; Rosenfeld et al., 2011 and Rosenfeld et al., 2012) and our conclusions are summarized herein.

The forgery trial was very thorough, lasting 7 years, and containing about 13,000 protocol pages, with hundreds of exhibits, reports and books. It expanded to more than 120 sessions that lasted more than 8 hours per day, some lasting until the late evening hours. The 74 prosecution witnesses and the 54 for the defendant (total of 128 witnesses) originated from different fields and came from Israel, USA, Canada, France and Germany. The court had to rule on the forging of certain antiquities most of which came from the antiquities market (unprovenanced) and had to hear testimonies and lectures from various scientific fields in: geology, chemistry, geochemistry, microbiology as well as experts from the humanities such as

archaeology, philology, epigraphy, paleography, Biblical scholars and more. The scope of the questions dealt with during the trial revealed many scientific as well as juristically issues.

We must praise the work of the Honorable Judge Farkash and his assistant attorney Inbal Moshe. They have painstakingly worked faithfully and with great skills to produce such an important verdict. Judge Farkash praised all the experts who appeared in the trial and said that his impression is that the experts were loyal to their fields and worked according to their skills, ability, experience and honesty in order to seek scientific truth. Judge Farkash believes that in the future new scientific methods that are more conclusive will be developed, enabling the identification of fake or genuine antiquities. The Judge expressed his regret that both sides did not succeed negotiating an agreement between them without the need to come to the “end of the road” – the verdict. A few times during the long lasting trial Judge Farkash suggested that the prosecution should drop the charges (Kalman, 2008). Judge Farkash scolded the IAA in his verdict stating there is a long reach from a suspicion of forgery to finding Golan guilty beyond any reasonable doubt.

The Judge emphasized that he found no proof of forgery, either regarding the artifacts nor any clue of an act of forgery by the accuser or his collaborators according to the indictment as is necessary in a guilty verdict. So the artifacts according to the court are not fakes and could well be genuine. It was not the task of the Judge to determine whether the artifacts are genuine, although he expressed his own view on some key questions. Only some scientific points from Judge Farkash’s verdict and testimonies by the experts in this trial were translated (we tried to be as accurate as possible). The brackets [...] are used by the authors for clarification. The numbers next to the subheadings are the paragraph numbers in the Judge’s verdict.

We should emphasize in our peer-reviewed publications we found nothing suspicious that would indicate that the JO inscription is not authentic (Rosenfeld and Ilani, 2002; Rosenfeld and Feldman, 2008; Rosenfeld et al., 2011; Rosenfeld et al., 2012; in press). We came to the conclusion re the JI, namely that our analysis strongly supports the antiquity of the patina, which in turn, strengthens the contention that the inscription is authentic (Ilani et al., 2002; Ilani et al., 2008; Rosenfeld et al., 2009). For the stone oil lamp with the Menorah and the seven species we concluded that the multi-layered silicified calcitic patina attached to the lamp’s surfaces are indicative of natural long term development in a burial setting. We can say with a high level of probability that the oil lamp, including its ornamentations, was produced many centuries ago (Rosenfeld et al., 2010; Rosenfeld et al., 2011). The verdict on the JI and the stone oil lamp will be discussed in a future publication.

THE JAMES OSSUARY INSCRIPTION

Our results:

The inscription on this ossuary says: “Ya’akov son of Yosef brothers of Yeshua.” Rosenfeld and Ilani (2002), Krumbein (2005), Rosenfeld and Feldman (2008) observed that the inscription was unprofessionally cleaned but, nevertheless, a genuine patina was found covering some of the engraved letters. The composition of the patina on the surface of the ossuary was the same as within some of the letters of the inscription. Namely, the beige patina on the surface of the ossuary continued into and through the engraving incisions. Thus, the engraving of the letters clearly does not cut the patina, a strong proof for authenticity. No evidence of modern engraving tools was found there. In addition to calcium carbonate, the patina on the ossuary is also composed of minerals (apatite, whewellite, weddellite) that are the product of geo-micro-biogenic

activity. The presence of micro-colonial long-living black yeast-like fungi forming pitted embedded circular structures indicates slow growth over many decades (Krumbein, 2005). We observed in some of the letters of the inscription the genuine so-called beige bio-patina or “varnish.”

Dust is a significant component of patinas that accumulates on exposed surfaces of artifacts and in soil. We have identified on many points within the patina covering the ossuary, numerous examples of embedded microfossils (nannoplankton and foraminifers) and quartz grains that are consistent with what is expected as deposition of wind-blown particles in the Jerusalem area (Ganor et al., 2009). The microfossils in the patina are similar in age (Cretaceous-Tertiary) to the marine carbonate rocks that are widely exposed over most of Israel.

The patina is enriched with phosphate up to 1.3% that probably originated from the dissolution of the bones (Keall, 2003). The presence of phosphate (from bones) that is incorporated into the patina is another indication of slow growth that supports the authenticity of the inscription. The patina does not contain any traces of modern tools and adheres firmly to the stone. Moreover, the formation of a patina on archaeological artifacts is probably produced in a series of sporadic events and is not comparable to continuous growth of stalagmite rings as suggested by Ayalon et al., (2004). Thus, it is inaccurate to assume that patina formation is comparable to the formation of stalagmites in a closed system ignoring all interactions with the environment, the microorganisms as well as anthropogenic interventions like war, destruction and fire during ancient times. See the conclusions of Professor Shemesh about the isotopic examination in the verdict below.

The results of the archaeometric analysis of the James ossuary and the heterogeneous existence of wind-blown microfossils, quartz and other bio-geochemical minerals that characterize the patina of the ossuary including the lettering engravings, does not indicate a forged inscription. On the contrary, it supports the contention that the inscription of the ossuary is authentic.

The IAA results:

The IAA material committee (IAA Report, 2003) came to the conclusion that the exceptional oxygen isotope composition of the “letter patina” above and below the expected oxygen isotopes -4‰ to -6‰ [PDB] could not have been formed under natural temperature and oxygen isotope composition that prevailed in Judea during the last 3000 years. Samples from the inscription yielded negatively anomalies values for oxygen isotopes between -7.5‰ to -10.2‰ [PDB]. It can be explained by artificial production through ground carbonate dissolved in hot water and heated to insure good adhesion of the newly artificial patina.

The ossuary and its beige patina is authentic but the inscription coating the “letter patina” or as Silberman and Goren (2003) named it “James Bond,” is very soft and can easily be removed by a toothpick. Microfossils (foraminifers and coccoliths) were found only in the “letter patina” and were never observed in other sites of the ossuary. The entire inscription cuts into the beige real biological “varnish” patina. “The inscription was engraved or at least, completely cleaned in modern times” (IAA report, 2003). All samples from the James ossuary’s patina and 3 samples from other ossuaries yielded the expected oxygen isotope -4‰ to -6‰ [PDB]. Only the last letter “Ain” of the inscription in the word Yeshua yielded a value within the expected range (-5.8‰).

Professor Goren (2005), a member of the material IAA committee accused us of being infected with the mental disease - the “Jerusalem Syndrome.” All the authors of this study are

experienced geologists/archaeometrists with numerous publications. Unfortunately, psychology is not within our purview and as “innocent victims” we are unable to react to such a sweeping accusation.

Discoveries during the trial:

In the summer of 2004 the Israeli police, with permission of the IAA, made a red silicone mold of the inscription destroying the “letter patina” by pulling out this “soft” patina which cannot be observed anymore, thus, destroying evidence. Consequently, the alleged small amount of masking letter patina is absent now and cannot be studied further. In science an observation and/or an experiment that is not reproducible or cannot be repeated should be ignored. When we first examined the JO inscription we paid attention only to the patina that occurred in the margins of the letters since we noticed that the inscription was unprofessionally cleaned and probably handled by an antiquities dealer. The microfossils (foraminifers and nannoplankton) have been found by us all over the ossuary (Krumbein, 2005) and not only in the faked “letter patina” as described by Ayalon et al. (2004). The obvious source of this microfossil component carried by ambient dust is from mechanical erosion of the numerous outcrops of limestones and chalks. The fact that the foraminifera are well preserved precludes the possibility that the patina was artificially deposited by the grinding of marine carbonate sediments as proposed by Ayalon et al.

(2004). According to Ayalon et al. (2004) the “letter patina” is composed of ground chalk dissolved in hot water. This is in contrast to basic chemistry: carbonate dissolves better in cold water and precipitates in hot water. The defense expert witnesses (Professors Marcus, Kronfeld and, Harrell) strongly rejected the IAA’s hypothesis of faking the patina by ground calcium carbonate patina dissolved in hot water (see also Harrell, 2004a, b; 2005).

Not only did the “Ain” yield the Ayalon et al., (2004) expected oxygen isotopes, also the “Het” in the word Achui (brother of) was measured for oxygen isotopes by Ayalon yielded a value within their expected range. However, this value was discarded and was not presented in the IAA’s report. This omission was discovered during the trial and the isotope people explained it by not trusting (?) the result of the sample that could have been contaminated occurring within 2 cm of the fissure that was mended in the Royal Ontario Museum. We should stress that the samples are very minute and were taken with the aid of a microscope and the “Het” sample was most probably omitted purposefully.

The patina and the oxygen isotopic contradictions:

The compositions of oxygen isotopes were measured in patinas on several artifacts from officially sanctioned excavations and exhibit a wide range of values (Shemesh, 2007). The judge accepted Shemesh’s report that rejected in his verdict the “expected range” and the forged theory of Ayalon and Bar-Matthews. The values of the oxygen isotopes vary so much that the discrepancies from stalagmite deposition range up to -8‰ [PDB]. It is clear that the use of the oxygen isotope method for the authentication of archaeological artifacts is premature and unreliable (Shemesh, 2007). To our knowledge this method of authentication is not used in any laboratory in the world today.

The expected oxygen isotopes of an archaeological patina during the last 3000 years according to Ayalon et al., (2004) must be similar to the stalagmite from the Bet-Shemesh cave (near Jerusalem) and ranging between -4‰ to -6‰ $\delta O18$ [PDB] which matches the annual rainfall of 500 mm in a subarid climate with a temperature range of 18-19 degrees Celsius. Deviations from -4 to -6‰ are strictly considered by Ayalon et al., (2004) to be a faked patina.

Surprisingly, Ayalon and Bar-Mathews contradict this oxygen isotope expected “normal” range in Orland et al., (2009). There, they examined the same stalagmite from the Bet-Shemesh cave using a very new and exact isotopic method yielding different values for the composition of the oxygen isotope range between -6.5‰ to -8‰ [PDB]. This new oxygen isotope analysis averages matches the annual rainfall range between 800-1200 mm during the Roman and Byzantine periods (during about 600 years; Orland et al., 2009, Figure 6). This is twice as much as their former annual estimation of 500 mm rain. These new data of oxygen isotopes averages -6.5‰ to -8‰ delta O18 produced by Ayalon and Bar-Mathews severely contradict their former expected oxygen isotopic range of -4‰ to -6‰ [PDB] (Kalman, 2009). The alleged faked patinas of the JI and JO revealed by the oxygen isotopes are now within the new range of Ayalon and Bar-Mathews thus undermining their own determination of forgery. After Ayalon and Goren’s carbonate dissolution in hot water concept was rejected in the trial by many chemists, Ayalon in his rebuttal testimony, changed his forgery method and suggested to the court that warm soda water was used by the forger to dissolve the carbonate (instead of the hot water alone). Ayalon and Goren, in a desperate attempt to save their “forgery theory,” demonstrated some uncontrolled soda water experiments (one was even performed in the courtroom) in order to support their new theory of how to forge a patina. The immersion of the ground powder and the soda were poured into the engraving of a modern limestone. But, after the defense attorney Hagai Sitton puffed into it and all the material was blown away. This demonstration falsified this method of creating a fake patina.

Moreover, the compositions of oxygen isotopes were measured in patinas on 56 artifacts from officially sanctioned excavations and exhibit a wide range of values (Shemesh, 2007). The values of the oxygen isotopes not only vary between different geographic locations but vary also in the same location as well as in the same artifact. About 30% of the oxygen isotope patina samples exhibiting more negative values compared to the Ayalon’s and Goren’s “expected range” (-4 to -6‰ [PDB]) values with discrepancies ranging up to -8‰ . According to Shemesh (2007) the deposition of patina is in a disequilibrium state and the oxygen isotopic equation cannot be applied for archaeological patinas (see the isotopic chapter of the verdict below).

JUDGE FARKASH’S VERDICT OF THE JAMES INSCRIPTION: “NOT GUILTY OF FORGERY”

Reasons for the acquittal

Here are some translations of the scientific summaries and citations of the experts’ testimonies written by the Judge Farkash:

The Epigraphy and the Content Aspect

Prosecution experts:

Dr. Asther Eshel (Bar-Ilan university) testified that she has a “feeling” that the inscription is a fake. The paleography “is not a sharp science.” “It is not 100% science.” “It is not unequivocal.” “The worst I can be is wrong and thank God nobody will die if it turned out that I did a mistake.”

Professor Ronnie Reich (Haifa, University; excavations in Ir David) testified: “there is nothing to point out in the inscription . . . that could indicate of any kind of a forgery.” “All these characteristics . . . indicate an authentic inscription from the late second Temple period (mainly the 1st CE).” The impression of the judge from Professor Reich’s testimony is that he still holds in the opinion that the script and the content of the inscription is authentic and “there is no typological or content-related sign that might indicate a forgery.” He was forced to change his mind to forgery according to the IAA material committee in 2003. All the words of the inscription were written by one hand and Professor Reich did not think that there is a difference between the two parts of the inscription which is written in a uniformly straight line. It is unreasonable to assume that before us there are two parts of the inscription, because in a cave it would be difficult to keep a straight line with the first half of the inscription.

Judge Farkash’s Remarks (71):

It is hard not to be impressed by the fact that different experts were influenced, some more some less, from other expert’s conclusions. For example Dr. Eshel wrote in her report about the different widths and depths of the engravings noted explicitly that these differences were reported to her by the material committee. Her conclusion was that two different chisels were used. In her testimony Dr. Eshel said that “there are accumulations of evidences from all kind of directions that cast suspicion on the inscription.” The influence of one expert on the other can be seen quite clearly in the case of Professor Reich who independently wrote in his report that the inscription is authentic before he heard the opinions of other members of the committee. But after he heard the conclusion of the other members of the committee he changed his mind.

Dr. Ada Yardeni, (Hebrew University, Jerusalem) testified: “I did not see anything that can prove on something that is not genuine . . . all the discussions done on this matter did not convinced me. Till today I think that this inscription [of the James Ossuary] is authentic, and that’s it! Till someone will step forward and say ‘I did it.’” “ Dr. Yardeni stood by decisive opinion and in her cross examination and confirmed that her testimony as stated above is accurate and said that if it will becomes clear that this is a forgery she will leave her profession [paleography-epigraphy].

Dr. Hagai Misgav (Hebrew University, Jerusalem), testified: “I know many ossuaries that were written and someone after a few years added [some words] to the original inscription . . . from the paleographical aspect the inscription is absolutely correct.” Dr. Misgav said that in general, ossuaries were written by family members and not by professionals. He said that “some of them were written in the darkness of the tomb, the variability of the letters is huge, the script could be [engraved] in a terrible way or in a professional formal way.

Judge Farkash’s Remarks (78):

To sum up till now, we can say that the prosecution witnesses on the script, the content and the archaeology aspects of the inscription, indicate no unequivocal clear and satisfactory conclusion, about the forgery of the inscription of the ossuary. Moreover, some of them (Professor Reich and Dr. Yardeni) support the opposite conclusion, in other words, that the entire inscription is authentic (at least from the epigraphy and content’s aspects). I should mention that some of the expert’s witnesses (like Professor Kloner and Dr. Eshel) testified that they are not experts in the adequate required field, and that they are experts in other general archaeological

fields which some of them are closer to the present subject, but it cannot be said that their testimonies are absolutely not relevant... On the contrary, Dr. Yardeni is an expert in paleography, with many years' experience and she actually thinks with an absolute certainty that the inscription is authentic, and that it was written by one man. Dr. Misgav also thinks in this manner and that he is a "specialist in this field."

The Defendant's Experts:

Professor Gavriel Barkay (Bar-Ilan University) testified that he saw the JO and his impression is that the inscription was engraved by the "same hand." He was asked to compare the two letters of the "Ain" in "Yaakov" and in "Yeshua." He replied, similar to like other experts' testimony, and maintained that there is no reason that the same form of "Ain" will appear in the same inscription even it was engraved by one hand, because this is "hand" work and not "machine" work. We should not look for a perfect uniformity because this was not done by a professional engraver, but in darkness conditions of a cave by a member of the family that writing is not his daily occupation.

Professor Andre Lemaire: is a Sorbonne Institute expert in Semitic epigraphy and has over 40 years' experience in the field. He is a Hebrew and Aramaic philologist that published 10 books and 400 scientific articles on the epigraphy and the history of Israel in the Levant; he participated in 20 official excavations in Israel. He expressed his opinion that the inscription was written continuously by the same hand, and there is no reason to doubt its originality. The combination of formal and cursive script is routine and normal, because this is only the deceased name for identification needs. He rejected the claim of the prosecution that the letter Dalet was copied from another ossuary and he maintained that the letter Dalet [in JO] is different.

Judge Farkash's Remarks (88, 89):

Also the testimonies of the defendant's experts in their epigraphy and paleographical conclusion supported the authenticity of the inscription on the ossuary, exactly as assumed by some of the prosecution experts. Judge Farkash writes: "My conclusion from the above is that in these aspects it was not proved beyond reasonable doubt that the inscription has two parts and was written by two different people. And even if it was so, there are logical and reasonable explanations that are accepted by many experts, mostly by the accuser's experts."

The Material Aspect

Prosecution Experts:

Dr. Elisabetta Boaretto (Weizman Institute) testified that she has not enough material in the patina of the JO for her laboratory Carbon 14 dating. Without sampling or obviously without carbon dating, she signed the report of the IAA material committee that the inscription is forged. She admitted that the other members of the material committee convinced her to sign for forgery even though it is not her specialty.

Mr. Jacques Neguer (IAA, chief art conservator) testified: "The Ossuary is authentic, the inscription on it is forged because of several reasons: the scratches and the engravings are

covered by artificial patina of round crystal grains occurring only in the side of the inscription; the engravings of the inscription cuts the original patina; probably the inscription was written by two different people and in different tools.” “I cannot tell if part of the inscription is fake or not fake.” “It seems I am not sure if this is 100%, but at least two people wrote the inscription.” “The differences between the depths of the engravings... originates from the kind of the material, as we talk about engravings on a stone which is not homogenous material, and it is not [the differences in the depths of the engravings] from the methods of engraving the letters.”

Superintendent Yehudah Novoslaski (deputy of signs and material in the Forensic Department of the Israeli Police) testified that he produced a silicone [red] mold and photographed it. He reported the results of his examination: “I found differences in the engraving tools between the first part of the inscription ‘Ya’akov Bar Yosef’ and the second part ‘brother of Yeshua.’” Because of this unprecedented examination by the police with the probable permission of the IAA [that retains custody of the antiquities] the inscription of JO was contaminated with red silicone. [The red silicone is a very sticky gummy like material that remained inside the letters and the area around it].

Professor Goren:

Professor Yuval Goren is an archeologist, head of the Department of Archaeology and Ancient Near Eastern Cultures at Tel Aviv University. He considers himself a specialist in the application of different geological methods to determine whether archaeological artifacts are forged. His methods include microscopy, mineralogical and chemical methods, including archaeological petrography. He mainly investigates ceramics. Professor Goren worked in the IAA from 1988 to 1996 and was in charge of the laboratory examining ceramics. Professor Goren also found that within the inscription on the ossuary an additional coating material appears as grayish color, a unique material that was not found on this ossuary or on other ossuaries he examined from the collections of the State. This coating is very soft on the inscription (easily grooved with a wooden toothpick), sometimes grainy and often homogeneous and fills the lower sections of the inscription.” This material covers the varnish in the areas adjacent to the inscription. Also, the grooves and the engravings (working marks) in the region of the inscription are coated with a layer of varnish. The entire length of the inscription is cut into the varnish and interrupts it. Microscopic examination reveals that the coating of the inscription is composed of calcite and common coccoliths (marine microfossils).

Professor Goren’s conclusion was that the ossuary itself is authentic both in typology and patina which is coated with a varnish. Goren’s conclusion is that "the engraved inscription was produced (or at least was cleaned in the entire length) in modern times ... the coating of the inscription is not natural. It was probably done by powdering and dissolving of chalk (maybe the engraving powder) with hot water and pouring the suspension on the inscription area for blurring the fresh engraving.” The final conclusion of Professor Goren was that “the inscription is a modern forgery.” The main findings of Professor Goren that led him to conclude that the inscription was forged are as follows:

1. There is a soft, patina-like material in the letters (the "patina letters"). In non-scientific publications, this material was jokingly called "James Bond" by Professor Goren.
2. The varnish on the surface of the ossuary is cut by the letters of the inscription. In addition, there is no varnish within the letters nor on the margin of the letters.

3. The presence of marine microfossils (coccoliths, foraminifers) in the patina covering the letters is not found on the ossuary itself. Professor Goren's conclusion is that the material found in the letters is not a real patina: "it is a combination of natural substances that were artificially placed within the letters."

About the occurrence of marine microfossils Professor Goren testified that he found a large amount of marine microfossils in the patina letters but they do not appear in the patina on the surface of the ossuary. "Thus it raised the possibility that the patina covering the letters was created by fragmentation and dissolution of the ossuary rock itself and artificially placing it in the letters." Regarding the findings of the microfossils in the patina, Goren testified for forgery: "because fossils cannot occur in secondary calcitic patina which crystallized below the surface [or] on the ground." "With my microscopic examination I did not find varnish in any place within the letters." However, unlike the others [researchers], including the material committee members, Ms. Orna Cohen saw the varnish in the word "Jesus." "My conclusion is that the varnish is not serving us in any way and therefore the key point here is the 'letters patina'. If the letters patina is ok, so it means that the inscription is ok. If the patina of the letter is problematic so we have a problem here." "I think this inscription presents problems that contradict the 'doubt,' meaning that it creates a situation where we have a doubt, which is very reasonable for its authenticity, even a serious doubt about the fact that the inscription is authentic." "This patina that covers the inscription, is not an authentic patina, it is not a genuine patina, it was not formed under natural conditions, in contrast to other patina occurring on the ossuary."

Judge Farkash's remarks:

(110-120): Professor Goren was cross examined at length on his [forgery] opinion, for five days of sessions, mostly lasted a whole day. Contrary to Professor Goren's initial clear cut position that he did not find varnish in the letters, it seems that at the end of his testimony some doubts appear, questions and indecisions on this issue. Thus, especially for the "Het" letter of the word "Achui" and the letters "Shin" and "Ain" in the word "Yeshua" ["Jesus"]. He examined the ossuary in July 2003, but now he cannot see the "letters patina." According to his hypothesis, [the "letter patina"] is a soft substance that can easily become detached from the letters, and the material probably came out when the ossuary has been reviewed by other investigators. **Also, the grains of the "letter patina" in the photos taken by the Royal [Ontario] Museum of Canada cannot be observed.** The fact that others did not see the "patina letters" [according to Goren] is that "all the experts do not always pay attention to details."

The letter "Het" in the word "Achui:"

Professor Goren agreed that it is possible to see the grainy substance ["letter patina"] covering the real patina only outside of the letter "Het". On the fourth day of his testimony Professor Goren brought a microscope to the courtroom through which he examined the ossuary. The letters were projected on the wall of the hall. First, he repeated his position that the varnish is not in the engraved "Het," later he admitted that "maybe" there is varnish in the letter "Het." Golan's attorney argued in his summation that an observation in the letter "Het" one can see clearly that the varnish goes into the upper part of the letter occurring in the groove of the letter. The prosecution also agreed that the court would need to determine what he sees (page 11,458).

The rule is that the court may also... use the sense of sight. However, the rule of "seeing" does not make the court an expert, and it does not obviate the testimony of an expert... However, and more than required I [the Judge Farkash] will add, that my impression when I viewed the

projected letters on the wall using the microscope in the courtroom during the hearing, it seems that there is a real claim that the varnish enter into the top of the “Het” letter. When it was projected in the courtroom we were directly impressed with the original colors, indicating, apparently, the existence of bio-patina in the letter “Het.”

The letter “Shin” in the word "Yeshua:"

Professor Goren admitted that if the version of defense is really true as to the form of the letter Shin, and he is not an epigraph expert, then the middle stake of the letter has a varnish stain (dot) (page 1197), and that such amount of varnish is enough to substantiate the claim that this is a real letter.

The letter “Ain” in the word "Yeshu:"

In the beginning of the testimony of Professor Goren he stated that "it can be" that there is varnish inside the letter “Ain” (pp. 1197-1198), and further in his testimony he reaffirmed that: "There could be a spot [of varnish] in the letter “Ain.” Professor Goren added, if we found within the letter “Ain” two spots with real patina, then "it could be that the letter “Ain” is genuine" but "this can have a very different and very strange explanations. “

After his testimony Professor Goren asked the prosecution’s attorney to re-invite him for further completion of the investigation. Professor Goren testified that the letter “Ain” caused him "many doubts," and the many days in which he testified were for him "an opportunity to look inside me" that is to see if the questions asked made him doubtful and in fact the only one that caused him to waiver was the letter “Ain” so much that after the hearing he asked the prosecution attorney to check again the ossuary without the pressure of being on the witness stand, and so he did: "I checked again the inscription all along, I checked the letter “Ain,” I took better pictures more sharper than in the past and the entire length of the inscription and mostly the appropriate sections of the letter “Ain.” And my conclusion from this examination was unequivocal, in the bottom line of the letter “Ain” there is varnish, a true biopatina. This conclusion is unequivocal "(page 2014), "And today you can see it (the patina - AF) so much better."

Professor Goren concluded his opinion thus: "So in the end, if you ask me to make any conclusion, the conclusion is that I was struggling, I have a dilemma. This silicone mold worked out for the better, "because you could see the intervals of the inscription. Without the coverage of the ‘James Bond’ or the ‘letters patina’... so... you could also observe this area...cleaner, meaning it was clear to see what is the varnish how it went there into the bottom line of the letter “Ain,” and other details.”

Defendant’s Experts:

Ms. Orna Cohen, is an archaeologist who specializes in preserving antiquities, has 30 years of experience in the field, and in the past she worked for the conservation project of the IAA. Orna Cohen was a member of the IAA committee, but was not summoned to testify on behalf of the accuser; she testified for the defense.

Microscopic examination by her showed that the second part of the inscription “Achui D’Yeshua.” "...a yellowish patina in letters can be seen as [occur] on the ossuary.“ However in the first part of the inscription a similar patina cannot be found within the letters. Her conclusion is that there is fraud and deception. Even if some of the inscription “Achui D’Yeshua” is original the whole inscription should be considered entirely false. Producing a superficial patina such as

crushed stone in the ossuary [inscription] shows a simple forgery attempts. It was clearly revealed how only in the second part of the inscription the patina had been discovered within the letters. It is the same yellowish patina that appears over the entire ossuary. The patina is going inside the letters: "Het," Yod, Shin and in the "Ain" (in the words "Achui D'Yeshua" A.F.) (p. 4716).

Ms. Orna Cohen testified that she examined the ossuary before the forensic tested it, and in her opinion, after the casting, the ossuary became contaminated by the silicone, because silicone sticks to everything and pulls out what adheres to it. Her estimation is that the patina she saw in the second part of the inscription is comprises a combination of bio-patina, minerals and chemicals ..., dissolved salts, etc., and is the result of something ancient that stayed in ground.. The ossuary was not engraved recently. Although she found the same patina in the letters of the ossuary Ms. Orna Cohen's conclusion was: "And I would argue that the second part of the inscription is genuine by the patina that enters inside [the letters], while the first part is probably late ... has no patina at all." The grainy material was added to contribute to the uniformity of the overall appearance of the inscription. She emphasized that she was aware that most experts were of the opinion that the second part is actually the fake, and yet she insists that the second part is authentic (page 4768). We should stress that the final conclusion was that even if some part of the inscription is genuine, the inscription should be regarded as an attempt to fake and mislead, and in this sense, her conclusion is consistent with other experts.

Dr. Dan Rahimi, is an archaeologist who works at the Royal Ontario Museum, Canada. His testimony was given by video conference from Canada. According to the testimony, in October 2002 Shanks [the editor of Biblical Archaeology Review, BAR] offered to exhibit the ossuary at the museum in Canada, the museum asked for documentation of ownership of the ossuary and the export permit by the Israel Antiquities Authority was presented. When the ossuary arrived he was surprised to see it was packed in soft cardboard, since this is extraordinary, and the packaging is usually a double packaging of wood or metal. When we opened the box we found the ossuary cracked. The Museum of Canada suggested a conservation proposal sent to the collector through a lawyer. The collector agreed to the conservation. Rahimi testified that the museum employees in Canada examined the ossuary before conservation, during and after and concluded: "We are convinced that the ossuary itself and its inscription are authentic."

"Under the microscope we saw the signs of cleaning, and under these signs, we found in the long parts of the inscription signature of patina...by microscopic observation ...we concluded that the inscription in all its parts is authentic."

Judge Farkash's Remarks: (132)

"The accuser claims that the findings of the museum in Canada regarding the existence of patina in the inscription grooves fully compatible with the description of the "letters patina" of Professor Goren, and therefore it is clear that the museum's conclusion regarding the authenticity of the inscription is wrong. Another argument is that all experts agree today that the material described by Rahimi is not a natural patina. I found no evidence basis for such claims, and therefore I cannot accept them. As mentioned, Rahimi was questioned on cross-examination and repeated the version that the museum professionals in Canada found patina in the grooves of the inscription. Although this is not an evidence that weight as an expert opinion, because the museum professionals themselves have not written a report of their opinion, and they were not

cross examined, but you cannot blemish their ability to distinguish between genuine patina and pseudo-patina material as Professor Goren found.”

Professor Krumbein:

Professor Wolfgang Krumbein is a German Professor of Geosciences specializing in Microbiology. He was invited as an expert witness for the defense in relation to various items including the ossuary. His opinion, in English and in Hebrew, was filed as N / 189 and the completion - N / 189 a [Krumbein, 2005]. Professor Krumbein is one of the important experts in various fields relevant to our case, including on bio – patina. Professor Krumbein carried out some investigations and analyses on the ossuary and its inscription especially on the patina on both of them. He meant to investigate them independently and to present his opinion about the conclusions of the material committee of the IAA and evaluate their scientific papers. Various tests that Professor Krumbein conducted clearly indicate that cleaning operations, sometimes roughly, were performed several times especially in the area of the ossuary inscription.

Based on a comparison of the JO to other ossuaries, it seems that the cave where the ossuary was situated collapsed centuries ago, or alluvium deposits penetrated into the cell of the cave with water and buried the ossuary, fully or partially. Remains of roots and climbing ferns, as well as "bio-pitting", confirm that the ossuary was placed for a long period of time in contact with soil or with alluvium, and exposed to atmospheric conditions other than those typical of a cave, for over a period of at least 200 years. Krumbein noted:..."and believe me it is a very hard work for the microorganisms, sized less than several millimeters to create such holes [bio-pitting] that can be observed by the eye, it takes a very long time.” Various tests conducted clearly indicate that cleaning was performed in a very rough manner. Based on the findings above, the isotope of the patina tests are not relevant to the question of the authenticity of the inscription. Professor Krumbein identified at least three places in the inscription of the ossuary (the first part and second part of it) the remains of a natural patina within the grooves of the inscription. Krumbein identified microfossils in the patina of the ossuary that are far from the inscription. The ossuary was identified as an antiquity [and genuine] by the IAA. The IAA researchers identified microfossil in the patina inside the ossuary inscription and mistakenly thought it is a fake indication. The presence of microfossil in patina, especially in items of stone from Jerusalem, has been published in scientific journals over a hundred years ago. The presence of micro - fossil in the patina of the inscription area and on the entire ossuary, actually reinforces the probability of the authenticity of the inscription. In his testimony Krumbein said only:”I say that the argument of the micro - fossil is not an evidence of forgery”, (4886-4889). It seems that the material sampled by researchers of the IAA is not the natural matter of the ossuary. This material [that the IAA sampled] may be a product of chemical reactions on natural patina, from the use of detergent or as a result of reaction of the rock material with water at high temperatures significantly above 24 degrees [in the cleaning process].

Professor Krumbein later in his opinion expressed criticism on the handling of the ossuary by the IAA, and the assumptions, methodology, findings and conclusions of the material committee of the IAA (such as: erroneous assumptions, inadequate methods, damaged comparative techniques, conclusions presented as a clear cut although they rely on assumptions that are not supported by controlled data; conclusions that are based on unverified climatic data, [conclusions] based on wrong chemistry, ignoring the possible effects of the cleaning, conservation and enhancement [of the inscription]. [In their conclusions the IAA material

committee] shows poor interpretation or misleading information regarding discovery of micro – fossils in the patina, lacking foundation, and ignoring relevant information.

Judge Farkash’s Remarks: (139)

“I am impressed from Professor Krumbein that he is a professional man, world renowned scientist with abundant experience. Therefore, there is no way to suspect his report about presence of patina that does not exist, or that he could not properly compare the photographs of the letters he observed under the microscope. Also by his cross-examination Professor Krumbein emphasized that he does not see evidence of human manipulation of the items examined, even if the tools with which he examined are not one hundred percent reliable (p. 5007). We should mentioned, that even Professor Goren was eventually forced to admit that he found varnish in some of the letters, exactly the same locations where Professor Krumbein pointed (such as the middle stake of the letter Shin, and the bottom stake of the letter “Ain”). Thus, this has to be enough to strengthen the findings of Professor Krumbein for the occurrence of the patina in some of the letters in the second part of the inscription. I will note also, that Professor Krumbein admitted, by his fairness, that he was wrong for not sampling the letters of the first part of the inscription, even though he knew the forgery charges were only on the second part of the inscription. However, he ruled out that Golan is the one that told him where to sample. This acknowledgment of his mistake [of Professor Krumbein] also strengthens his professional credibility in my eyes.”

The minimum time for the development of patina, and the option to accelerate the patina growth:

Professor Krumbein noted that under the examinations and comparisons he performed, he can safely say that it took at least 50 to 100 years to develop a patina of the particular composition whose remains were identified in the ossuary inscription, but this does not mean that the development [of the patina] did not last over a much longer period, of hundreds of years. In his opinion, if we consider also the existence of additional findings, such as the presence of bio-pitting, micro - fossils, micro - organisms and oxalate acids in the patina, it is clear that the ossuary patina developed over centuries, if not thousands of years. The patina sampled far from the inscription has the same composition as the samples taken from the inscription and identical to the flowing patina from the surface into the inscription. There are no signs of adhesive use in the patina. The conclusion, in his opinion is that the patina in the inscription and the patina on the ossuary were created in the same period of time.

Judge Farkash’s Remarks: (143)

“According to Professor Krumbein, who is a world renown expert in the field of bio-patina and one of its founders, a period of many years is required for this patina growth, and in any case, his examinations brought him to the conclusion that **“the patina on the ossuary evolved over centuries, if not thousands of years, and that the patina within the inscription and the patina on the ossuary were created during the same time period. The conclusion of Professor Krumbein in this matter is not hidden and I accept it.”** ...”it should determine that the existence of varnish in the letter “Ain” in the second part of the inscription of the ossuary is a plausible option, and it has to establish reasonable doubt.”

In summary of all findings Professor Krumbein noted that he "reinforces the probability that the inscription itself is ancient and most of the original patina vigorously cleaned (using a

sharp instrument and cleaning materials) and that the inscription was treated over the years more than once." In his cross-examination Professor Krumbein was asked if he can prove that the sharp object was used for cleaning the inscription and not for making the forgery and he answered: "But I think the evidence is quite clear from the photographs of the inscription."

The accuser's attorney maintained that the claim in this issue [the cleaning] of Professor Krumbein was not proven by him. I do not share this assumption. Professor Krumbein testified that he found evidence of cleaning operations using primarily a sharp object in the inscription area, and pointed to the findings in photographs. It must be noted that other experts, including the prosecution experts, found evidence of cleaning operations by a sharp object. Recall that the final conclusion of Professor Goren in his opinion was that: "The inscription engraved (or at least was cleaned the entire length) in modern times."

As mentioned, Professor Krumbein criticized the IAA committee in a number of ways, including various presentations by the IAA that completely ignored that cleaning and handling operations carried out to the inscription. These operations were diagnosed by microscopic examination carried out in Israel and Canada and written as part of its conclusion of Professor Goren. Thus, Professor Goren agrees that the inscription may be cleaned using a sharp instrument. Golan's attorney sought to draw this formulation in itself which is enough to place a reasonable doubt to the guilt attributed to the Golan. Because this cleaning of the ossuary and particularly the cleaning of the inscription are significant for another aspect - the isotope tests of the material committee. I'll decide in this argument later on."

Dr. Amnon Rosenfeld and Dr. Shimon Ilani:

Dr. Amnon Rosenfeld has a Ph.D. degree in Geology and was Geological Survey employee [now retired]. As he said of himself, he has 40 years' experience in the study of microfossils and is an expert in determining the age of the rock strata, and has expertise in Archaeometry, a science that links the natural sciences of chemistry and geology with archeology. Dr. Shimon Ilani also has a Ph.D. degree in Geology and is currently a Geological Survey employee. His main research field is economic geology, and in his research he deals with petrography, geochemistry and the mineralogy of rocks and is an expert in archaeometry. Together they were asked by Dr. Amos Bein, the Director of the Geological Survey of Israel, to examine several items, including the ossuary. They were brought to testify as experts for the defense. The conclusions of Drs. Ilani and Rosenfeld were that not only they did not find evidence of forgery in the artifacts examined, including the ossuary, but also found positive points that support the fact that the artifacts are authentic. Dr. Rosenfeld reiterated at the beginning of his testimony and said that "we did not determine that the artifacts are hundred percent genuine, but most probably they are authentic... In any case we have contributed and we have published these studies on the three ancient artifacts, fearlessly, honestly and truthfully, with faith in our tools that we've examined and published them."

"We found no signs of forgery and, believe us, we were examining the artifacts for more than three months, nearly a year, in the case of the Jehoash inscription and more than a year on the stone oil lamp, and we were looking for [evidences of] forgery, but we found only positive points to support authenticity"... "We worked without being biased toward one side or another; we aspired to seek scientific truth by using our tools and according to our experience regardless of the outcome.

These are the points recorded by Drs. Ilani and Rosenfeld in their opinion, and presentations, as supporting the authenticity of the ossuary inscription:

The natural patina (varnish) covers engraved letters of the ossuary at both the beginning (the letters: Kof, Bet and Bet) and at the end (the letters: “Het,” Yod”, “Shin” and “Ain”) of the inscription. A sample obtained from within the patina covering a groove (=letter) indicates that the patina has worn elemental [minerals] particles from the rock along with microfossils characteristic of the environment in which the ossuary was discovered. There were no suspicious elements of modern tools; illumination by ultraviolet showed no signs of new engraving or glue.

The inscription was vigorously cleaned by sharp mechanical tools, possibly combined with detergent and/or acid, but it is apparent that cleaning operations did not remove all the natural patina. The presence of microfossils in the patina covering the letters is known also from other ossuaries and by ancient objects occurring in the soils around Jerusalem and Judea.

Within the inscription and around it there were scratches covered with patina. The forms are typical of scratches known in antiquities; they are gouging both the ossuary and the engraved letters at the same directions.

The intense weathering of the rock precludes the possibility of new engraving, since this was likely to smash the rock or crack it; cleansers can contain carbonate with very negative oxygen isotopes.

It was also recorded in their opinion that they did not observe the gray, grainy material documented by Professor Goren and was called "James Bond." The accuser's attorney, in his summary, pointed out a number of problems in their opinion report and in their testimonies, including contradictions between two of them even though they carried out the examinations together. I [the Judge] will emphasize that Dr. Ayalon, the prosecution expert, praised the work of these two men and their good examinations so much that he even relied on their results (p. 819).

Judge Farkash's remark:

However, due to the conclusion I already reached - that even if I will completely ignore Dr. Ilani and Dr. Rosenfeld conclusions, there is a reasonable doubt as to the forging of the ossuary inscription. I do not see the need to decide, at this stage, about the claims of the accuser; these will be discussed below, as it may be necessary for the relevant issues.

Silicone casting results:

Judge Farkash's Remarks: (153)

“In addition, Golan argues for his defense, that the silicone casting made by the Forensics Department [of the Israeli police] drew out with it the material that was inside the letters of the inscription. So, [Golan's claim] is that today you cannot examine the ossuary in its former condition before the forensic examination. According to this argument, the defense of Golan suffered a substantiate damage, and this reason alone is enough to acquit him.”

Judge Farkash's Remarks: (154)

The role of the investigators authorities is not to find evidence to convict the suspect, but to find evidence to expose the truth. Non-compliance in this regard can cost the investigation failure that will bring acquit the defendant, but only if the investigation failure "is so severe that there is fear that the defense of the accuser has been deprived, because we find it difficult to deal adequately with the material of evidence against him, or to prove his version ... according to this criterion the court should decide what would be the weight for this failure, not only when it stand for

itself, but also viewing the totality of the evidences. In our case, there is no dispute that the casting of the silicone by the forensics people changed the physical condition of the inscription of the ossuary.

But Superintendent Yoni Pagis testified that he never ordered the forensic investigators to make the casting of the silicone, but only allowed them to examine the ossuary. The idea to make a mold of the inscription was done at their own initiative.

Orna Cohen, a member of the committee who testified for the defense, expressed also her opinion that the silicone casting "polluted" the ossuary: "I saw a picture of what happened to the ossuary. What trauma it had. In fact when using the casting silicone for taking a mold you have to put some substance that separates the object from the silicone, because the silicone sticks to everything and pulls it out. Even if there was a patina I guess that the patina was drawn out... I think [the inscription] is dirty and it will be hard to say something on the ossuary itself." (page 4717, lines 6-12).

Professor Krumbein testified that during his examinations he encountered a problem: "There is another problem I want to document. My research was not so easy because of remains of treatments. It is possible that the very soft rock and the copy [of the inscription] made by the police led to remove the patina along with parts of the rock beneath it." (p. 4899).

Judge Farkash's Remarks: (156)

Therefore, there is a possibility of high degree of confidence that the casting of the silicone removed other materials that were in the inscription of the ossuary. This damage prevented Golan from examining the ossuary itself with the help of experts on his behalf in order to review counter opinion to contradict the opinion of the prosecution. So, it was impossible to check the "patina letters" that was reported by Professor Goren that found it in the inscription, but it could be that the bio-patina was pulled out along with the casting, but currently it is not possible to examine and to sample these findings. Moreover, of the experts who examined the ossuary before the casting of the silicone, Professor Goren is the only one who did not find real patina in the inscription, compared to other experts who reported on findings of real patina at the ossuary inscription, and we are talking about experts whose reliability and professionalism are not in question, and they are not suspected to have falsely reported or they did not "understand" what they saw (see for example the testimony of Orna Cohen, Rahimi, Dr. Ilani and Dr. Rosenfeld as stated above).

Judge Farkash noted that "We are dealing with a criminal case, so that the question cannot remain 'hypothetical' in the words of Professor Goren, but we have to determine the accuracy of the evidence. In this situation, in light of the principles of the cited law case above regarding the failings of the investigation, and considering the entirety of the evidences for this charge [count number 1], **I believe that the casting of the silicone affected Golan's defense so he was deprived in such a way that it strengthen the reasonable doubt regarding his charge guilt.**"

Images of the ossuary (N / 201), evidence of Ms. Schlossberg and the opinion of Mr. Gerald Richards (231-248):

In his answer to the indictment Golan claimed that he bought the ossuary as is in the 1970s from an Arab dealer in East Jerusalem, and it stayed with him when he lived with his parents. According to him, he tracked down and found two photos [black and white] of the

ossuary that was taken in the seventies. The ossuary can be seen in Image F / 201 with two shelves with a school library book belonging to the Technion [in Haifa, where Golan studied engineering], a 1974 phonebook, Elton John's record, and an image of his girlfriend at that time, Ms. Schlossberg. To support his statement regarding the date of taking the picture Mr. Gerald Richards, a private consultant in forensic science and the analysis of photographs and documents testified. He holds a BA degree in photography and an MA in education, and he teaches courses in U.S. universities. Since 1970 he worked in the FBI, first as an agent, then as a researcher, a supervisor in the document and photograph labs, then served as the head of the operations and research (documents), and finally worked as the head of the photography special unit. In his opinion he stated, that although you cannot determine definitively whether the pictures were produced through the 1970s, there is no sign indicating or implying that they were not made in March of 1976, as indicated by the stamp that appears on the back of the picture. In addition there is also a normal wear and tear of the pictures as a result of time and handling... All the specified characteristics and features are indicating that the photos are not produced recently, but were made mid-to late 1970s.

Judge Farkash's remarks:

I was impressed with Mr. Richards, his professional expertise, knowledge and experience in testing documents and images. His testimony was credible, coherent and clear. I have carefully considered all the allegations relating to the snapshots N / 201, but I think there is not enough support to prove that the pictures were staged or forged by Golan, however sophisticated he is. **I accepted Mr. Richards's testimony and I adopt it.** Recall, that the prosecutor did not put on the stand an expert in photography to testify, and in fact the prosecution admitted that he lacks definitive proof that the pictures were staged and filmed recently. I can only determine that it was not proven that the images were made recently, and there is no reason to assume that they were not taken in the 1970s. Therefore, and together with the above, **they also support the existence of a reasonable doubt regarding Golan's guilt of this charge.**

ISOTOPE TESTS

Drs. Avner Ayalon and Miriam (Mira) Bar-Matthews (157-174) Summary and Conclusions by the Judge A. Farkash:

As we shall see, the isotope test was a central, but not the single examination that the accusers relied on in bringing the indictment in this charge [count number 1] and on many other charges. It turned out that much of the discussions and disputes dealt with this isotope examination. This test is known and familiar in different scientific fields, but it was the first time that it was used in an archaeological venue. So, we should investigate herein the validity of this examination as a scientific method to discover in general archaeological fakes. In summary, we should state that the isotope test samples the isotopes of the calcitic patina and mostly examines the isotopic composition (in other words the ratio of the different isotopes) of oxygen in calcite, but also the carbon isotope composition of the calcite. Isotopes are different atoms of the same chemical element with similar chemical properties but having different masses. Moreover, it should be noted that there are stable isotopes in nature, that do not decay, and radioactive isotopes that are not stable and decay spontaneously [e.g. uranium.] The test method discussed in

this case concerns the examination of stable isotopes only. As stated, this case has focused on examining the stable isotopes of oxygen but also of carbon.

Drs. Avner Ayalon and Mira Bar-Matthews both hold Ph.D. degrees in geology, working at the Geological Survey of Israel as researchers. Their specialty is isotope geochemistry the study of chemical processes and phenomena in nature. They engage primarily in reconstructing climate changes. Dr. Ayalon said that he had no background knowledge or interest in archeology. He said he first heard about all the exhibits discussed in the media, and he did not know or knew about this issue until he was asked to serve as a member on the committee (p. 817-820).

We [the Judge] have to note that in support to the work of the prosecution experts [Ayalon and Bar-Matthews] the accuser invited for her claim additional two isotope researchers to testify: Professor Yehoshua Kolodny [Hebrew university, Jerusalem; Israel prize winner in Earth-Sciences], the founders of the isotope research in Israel who also taught and guided both Dr. Ayalon and the defense expert [Professor Aldo Shemesh], as well as Professor Alan Matthews [the husband of Mira Bar-Matthews] from the Hebrew University in Jerusalem.

Dr. Ayalon, a member of the IAA material committee, submitted his final report to the IAA. Dr. Ayalon explained the main points of his examination and results. His research focused on "isotope examination" that examined the isotopic composition of oxygen in the patina on the items subject of the charges. In essence, the conclusion is that the oxygen isotope composition of the letters' patina could not have been formed naturally in the conditions of the temperature and the water composition typical of the mountains of Judea during the last two thousand years. Thus, he concluded that the composition of the patina found [in the inscription] can be only explained by artificial producing in different ways.

Previous studies carried out by Dr. Ayalon and Dr. Bar - Matthews on climate reconstruction of the stalactite cave [Soreq cave, 30 km west of Jerusalem] concluded that during the last 3,500 years there have been no drastic climate changes, both in terms of temperature and water composition. Based on these studies they were able to calculate the "expected range" of the isotope values of the calcite deposition in the Judean Mountains (pp. 826-827). Their calculation showed that the oxygen isotopic composition of calcite deposited in the patina in the Judean Mountain region for the last 3,500 years is in range of -4‰ [PDB] to -6 ‰ [PDB] which is the "expected range." The isotopic testing of the patina of the artifacts that are the subject of this indictment [fake artifacts according to the prosecution] will determine whether the patina on the items was developed in natural environmental conditions of the Judean Mountains. The experts' working assumption was that the isotopic composition beyond the "expected range" indicates an artificial patina.

The primary defense claim on the isotope test sought to cast doubt on the "expected range" according to the prosecution experts. Because it is based on research carried out only in caves, which cannot be inferred on the climate that prevailed outside the caves and in the locations where these archaeological artifacts were buried. In addition, the parties disagreed on the degree of "flexibility" of the expected range, i.e. the degree of deviation from the expected range that can be still explained by natural processes, and which results deviate from the "expected range" that as such will be considered as unexplainable [fakes].

Is it possible to recognize the isotopic examination as acceptable "scientific" evidences? - The legal framework:

Judge Farkash's Remarks: (175-181).

The isotopic test is not an example of direct evidence presented to prove the guilt of the defendants, but it is only circumstantial evidence. It is "scientific" evidence that is important such as experts' testimonies, (e.g. fingerprint etc.) **The prosecution wanted to accept this isotope test as it is done for the DNA experts' testimonies.** Prosecutors seek to adopt the isotope test on patinas as an acceptable and reliable method for identification of archaeological forgeries, though everyone agrees that this method was applied in the antiquities field for the first time.

There is no dispute, that the credibility of any scientific testing, in itself, constitutes a prerequisite for admissibility of the results, along with examining the credibility of the expert presenting it. As shown to the court a new test-method, "that its results have not been tested in the courts - the court should set a principled position concerning the ability to rely on its results, and having so – the way is paved for its admissibility based on evaluation of credibility of the specific expert testifies in the court."

Case law states that for recognition of a new examination as acceptable evidence, it must pass "fire-tests," figuratively stated by the Honorable Judge Misha Cheshin... A "Scientific Evidence" "must pass" the fire-tests "until - the court will recognize it as an acceptable "scientific" evidence... the court should be convinced that the scientific theory, or - the basis of which the tests are being established in this matter are accepted in the scientific world; expert witness will testify that the procedures of the tests are acceptable in this scientific profession held in this issue; expert witness will testify that he/she carried out the examination and that it was performed correctly."

The argumentation of Dr. Bar - Matthews is that artificial patina can be produced in different isotopic [oxygen isotopes] compositions, light or heavy, depending on the temperature and composition of water that permeates the patina as it is being deposited. In other words, the presence of patina with isotopic composition within the expected range cannot indicate that the accumulation of the patina on the item happened during the last two thousand years, in other words an authentic patina, as well as a fake patina can be within the expected range. On the other hand, the negative results outside the expected range cannot be explained in some natural way, but it should indicate of some human manipulation.

The attorney for Golan would like to learn that the isotopic examination is not a clear cut one and nothing can be deduced from it. Because the results within the expected range are not necessarily indicative of authenticity and they possibly can be fraudulent, and the results outside the expected range are not necessarily indicative of forgery and the proof is that the first part of the inscription is out of the expected range and even though the starting point of the prosecution is that it is authentic. I cannot agree with this claim as it was formulated. The fact that the results within the expected range can be explained both authenticity and forgery, does not provide an answer about the results outside the expected range, for which the claim is that it could not be formed under natural conditions, in other words, they are resulted by some human intervention.

There is more. As rightly noted by the attorney for the Golan, if we accept the isotopic examination as a reliable test and appropriate to detect forgeries, such as for a DNA sample or for fingerprints results, we should set rules and standards for its acceptance. In this case, only 10 samples were taken from the ossuary when two of them did not have enough material for testing. Is it enough to get a reliable test from only 8 samples for establishing a criminal conviction? The question is asked more forcefully when, from the second part of the inscription - whom the

accuser claimed was forged - only four samples were taken. Half of them gave results within the expected range and half outside the expected range. The conclusion of the researchers is that samples within the expected range cannot necessarily signify an authentic patina.

However, this option of authenticity is alive and existing and is one of two options (authentic or sophisticated fake, having patina with isotopic composition within the expected range). That is to say, that there is a reasonable option of 50% probability of the existence of calcitic patina in each of the two authentic letters ("Het" and "Ain") out of four samples in total.

...In relation to the ostraca 1 and 2, [count number 3] the results obtained in the letters Shin and Vav (-10.2‰ PDB and -7.74‰ PDB) fall within the broader values that the defense expert Professor Aldo Shemesh found. Professor Shemesh is also an expert in isotopic geochemistry [Weitzman Institute, Rehovot]. As I rejected the criticisms by the prosecution about Professor Shemesh's report of opinion and testimony and determined that no flaw in any quality was found in his sampling, his findings have raised a real doubt in relation to the limits of the "expected range" as determined by the prosecution experts (see details below in count #3). I am aware that Professor Shemesh has not examined the ossuary and he did not address the issue of stone samples (pp. 8636-8637), because he has been called to testify on behalf of the defendant Deutsch, who is accused of [the ostraca charge]. Despite this I do not believe there is enough [reasons] to impair Professor Shemesh's results and conclusions. See later [in count #3 below] on my conclusion about Professor Shemesh's quality of sampling.

However, one sample from the side of the ossuary yielded the results of -6.68 per mil. There is no dispute that the ossuary itself is an authentic item but the result is surprising, to say the least. Dr. Bar-Matthews then replied that "there is no such thing as a sharp and clear boundary, covered by our results which are around minus 4 to minus 6, minus 6.5. Minus 7, we have never received such a result for a secondary calcite, in all the Judean Mountains for the last three thousand years." (p. 2565); "the point of -6.68 is slightly exceptional, if it was in the Judean Mountains, if it was buried in the Judean Mountains, it is a little unusual." (p. 2567), and that "the value of minus 6.68 is more negative than all the findings we have found to date."

Also Professor Kolodny was asked: what is the lower limit of the "expected range" and he replied: "at some point it starts and at some point it is no longer there ... I do not know. I cannot draw the boundary." But later he added that there is a range "and things have to fall within this range." In other words, although he cannot define the boundary line, there is still a definite border line. So, we find another surprise regarding the issue of the lower boundary of the ["expected range"] which was not explained satisfactorily.

My conclusion is that the claim of Professor Harrell regarding a possible effect of detergents on the isotopic composition of the letters patina is that the evidence was not proven in a way that could be accepted as a reasonable doubt. However, the argument about the cleaning of the inscription with a sharp object establishes, in my opinion an additional reasonable doubt regarding the forgery of the ossuary inscription. Recall that Professor Goren, testified that he chose the alternative formulation of cleaning the inscription "for caution," because he thought it was possible that the inscription was cleaned using a sharp and hard tool, such as a nail (p. 1082). As indicated above, this observation [of cleaning with a sharp tool] is also supported by other experts (eg. Professor Krumbein, Mr. Neguer and others), and as we shall see in the factual aspect, we cannot reject the possibility that this was done by Golan himself or on his behalf, and therefore it is not a purely theoretical option.

Material aspect - isotopic tests - Professor Aldo Shemesh Summary and Conclusions by the Judge A. Farkash (637-702)

(Count # 3 - Ostraca 1,2 and 3)

The defense filed a counter report of opinion (Shemesh, 2007) on the isotopic subject by Professor Shemesh, Department of Environmental Sciences at the Weizman Institute of Science. Professor Shemesh has a BA degree in geology and chemistry, a master's degree on samples from the sea dealing with isotopes of the carbonate system, a Ph.D. from Department of Geology at the Hebrew University. His doctoral thesis dealt with stable isotopes, oxygen isotopes and rock phosphate. He studied as a post-doc at Columbia University in New York. Professor Shemesh's research deals with natural isotopes in geological systems; he was a student of Professor Kolodny. Professor Shemesh also published numerous articles and served as a lecturer in various fields.

We note that there is no dispute about the professionalism and expertise of Professor Shemesh in the relevant field. The prosecution's experts - Dr. Ayalon, Dr. Bar - Matthews and Professor Kolodny - praised Professor Shemesh and mentioned that he is the country's leading specialist in the field of isotope geochemistry (p 4228). Needless to say, that I [Judge Farkash] was impressed by his expertise and his extensive knowledge. The prosecutors seek to cast doubt on the degree of Professor Shemesh's objectivity. My impression is, as noted, that Professor Shemesh is loyal to his scientific duty and his objectivity is impartial as he declared at the beginning of his testimony.

In the chapter "scientific argument" Professor Shemesh elaborated an introduction of scientific infrastructure about which we are dealing - the oxygen isotopes and their relationship to temperature and water composition. At the end of the chapter Professor Shemesh introduced the prosecution experts' claim that the isotopic composition of creating patina that is incompatible with low temperature (temperature of the soil surface or in shallow burial) and with the kind of water that is common in the country it will be interpreted as a forgery or it passed the reaction [cooked] in a modern oven. It was noted that **we have no direct evidence of the isotopic composition of the water in ancient times**, since water from these periods were not saved to measure directly. In two papers, both by Bar - Matthews (co-authored by Dr. Ayalon) and with Rinsberger, showed that the isotopic composition of water depends on the intensity of rain and the track which it came to Israel, both are clearly unknown parameters not from ancient periods in general and/or specifically not from a particular site.

A total of 56 well documented archaeological items [from official excavations] were sampled [by Professor Shemesh], with a wide distribution from the north to south of the country [Israel]. This was done by a gentle scraping of the surface of the patina using a scalpel, sampling about 2-10 milligrams of material. The powder that was scraped off the pottery – the "patina" – was weighted in the Weizman Institute. In cases where the powder was not enough there were two "running" [examinations] of the same sample to determine the repeatability of the measurement. The measurement was done by a mass-spectrometer analysis of stable isotopes. The calibration of the system was done by international standards and by internal standards of the laboratory. All values are reported relative to PDB standard and the unit of the measurement is presented in per-mill.

The results of the samples analyzed by Professor Shemesh are presented in a table appended to his report. The conclusions from the data of the analysis were as follows:

A. - In samples which were both examined by Dr. Ayalon and by Professor Shemesh – an excellent correlation between the results exist. Although the isotopic measurements were not

executed on the same powder sample and every researcher sampled the artifact independently. We should assume that the patina samples on the artifacts lacked homogeneity of some degree.

B. - Most of the oxygen isotopic values of the patinas from the country are in the range of -2 -to -6.2 per mill.

C. - Two of the three measured sites with a large number of samples (Tel-Hazor, Tel-Dan and Tel-Gat) yielded in their patinas measured values of oxygen isotopes that have a very wide distribution, completely contradicting with the basic work assumption of Drs. Ayalon and Bar-Matthews. The measured variability range in Tel-Hazor was of 8 per mill and in Tel-Gat the measured variability range was of about 9 per mill. In Tel-Dan the distribution results [of the oxygen isotopes] are smaller, about 1.5 per mill although this distributed result analytically is very significant.

D. - The oxygen isotopic values of the patinas do not indicate a clear trend by regarding geographical distribution in the country. Various sites in north and south, a topographic high or low, sites more or less close to the shoreline, do not show any relationship to the values of the oxygen isotope.

E. - There was no relationship between the oxygen isotope values of the patina and the [archaeological] age of the sites.

Another problem according to Professor Shemesh is the lack of calibration of the patina. In the professional scientific literature there is no accepted worldwide calibration between the isotopic composition of a patina to the temperature of patina formation.

The prosecution's experts measured a total of 10 samples. Professor Shemesh in his report has introduced the largest number of measurements of patinas from Israel [56], and it seems that even those are not enough. There is no patina calibration that links the isotopic composition to the ambient temperature.

Another aspect, in the opinion of Professor Shemesh that calls into question the use of isotopes in a patina as a tool for determining authenticity of archeological artifacts is the fact that at one site the oxygen isotopic values of the patina are completely beyond the range of values of different temperatures and water composition. Thus, samples in Tel-Hazor [delta oxygen -4 to -12 per mill] and Tel-Gat [delta oxygen -3 to -12.5 per mill] that were measured showed a difference range of 8 to 9 per mill, respectively. The conclusions of Professor Shemesh, as presented at the end of his report of opinion, are as follows:

A. The use of oxygen isotopic composition of a patina cannot determine authenticity and cannot yet be used as geochemical tool. So, cannot be used in court or in forensics without arising reasonable scientific doubt.

B. Lack of calibration/relationship between the forming temperature to the isotopic composition of the involved water and the isotopic composition of the deposited patina as exemplified by the data collected here, prevent the use of the palaeo-temperature equation that is common for carbonates [as was used by Drs. Ayalon and Bar-Matthews].

C. To the best of Professor Shemesh's judgment and based on his scientific experience and publications, the level of our understanding of the mechanism creating the patina and the processes that determine the isotopic composition is not yet developed enough to maintain that a new scientific tool allows identification of a fake patina. The data presented in this report [of Professor Shemesh] as well as the data presented in the report of Dr. Ayalon, are still insufficient to create a new tool in geochemistry.

However, Professor Shemesh, argued that although he sampled a larger number of samples than the prosecution experts, yet in his opinion it is not enough.

"In my opinion, the amount of measurements in the report submitted by Dr. Ayalon was not enough to clarify the facts. And therefore the first pillar in a geochemical research is first of all to collect the information, without any prejudice, without any intentional bias. ... "I do not see a wide data base, wide enough to determine such truths certainly I did not see a data base wide enough to come before the court." ... "I emphasize that what I did, is very far from being complete, far from being absolute, and far for me, from running and waving conclusions "... (page 8574).

Disequilibrium:

Another argument that has been presented by Professor Shemesh as criticism of the isotopic test refers to the impossibility of proving, by an external criterion (not isotopic), that patina is deposited in isotopic equilibrium without the influence of kinetic processes effecting the system, that is the patina as well as calcite were deposited under ideal conditions without "disturbances" of unrelated variable factors. Professor Shemesh's opinion, in the absence of proof of equilibrium, it is impossible to use the isotopic composition equation as did the prosecution experts, since the equation assumes a deposition under equilibrium conditions (p. 8550 and later). For the claim about disequilibrium Professor Shemesh relied among others, on the article written by the prosecution experts (Dr. Bar - Matthews, Dr. Ayalon and Professor Matthews) together with others (Article - T / 271) (p. 8694 and later).

Professor Shemesh also stressed that he told the defense that one condition he insisted before sampling the [patinas], that he will be able to come to an objective conclusion – "They taught me and educated me that in science you have to present everything ... THE GOOD, THE BAD AND THE UGLY."

However, you cannot remove a sample from the database only because the result is not "appropriate" or was not expected or it is apparently "abnormal" isotopic composition result and if they do so [Dr. Ayalon and Bar-Matthews with the "Het" sample] then it will be a "scientific bias and a circular argument" (pp p 8594; 8627-8268).

Professor Kolodny also praised Dr. Ayalon and Professor Shemesh, who were his students. He is proud of both of them and does not question their integrity (p. 4043).

Judge Farkash remarks: **I accept** the position of Professor Shemesh, that in the absence of an external objective criterion for disqualifying this sample or other sample, we cannot invalidate a sample, based only on the outcome of its isotopic composition. **I was convinced that if we do so, it will be "scientific bias or circular argument."**

We have to accept the detailed examinations and results of Professor Shemesh, as well as his conclusion that it is impossible at this point to base any findings on the basis (that was not yet properly proven) of the [oxygen isotopes] "expected range" of patina on pottery. The patina results for the authentic pottery items found in the official excavations (from – Tel-Gat and Tel-Hazor) gave much more negative results than the "expected range" determined by the prosecution experts. This conclusion is supported by the statements made by the prosecution witness Professor Kolodny as follows: "... these two distinguished men (Dr. Ayalon and Professor Shemesh – AF) **if they checked the same things then there is a doubt in the validity of the method"** (p. 4090).

Judge Farkash's remark:

“I think, therefore, that it is sufficient to establish reasonable doubt about the validity of the isotope examination to check forgeries as a method in terms of [patina on] ostraca [as well as on stones]. It is quite possible, as also affirmed by the defense expert Professor Shemesh, that in the future the isotope examination could be a viable method in detecting forgeries in antiquities – as the research progress on this issue.”

Judge Farkash Summary of the factual aspect of the Ossuary (302-305)

The findings and conclusions set forth in the factual aspect of the trial can be the basis of conviction of Golan or can establish a reasonable doubt in this matter.

THE VERDICT

The accuser’s attorney rightly pointed out that the charge [count # 1] in question is difficult to prove: "I know what I'm doing is exceptional and I've been saying if the ossuary was standing alone in the trial, we probably would not continue the process ..." (p. 11462, line, 11-15). Despite this, the prosecution believed that the evidence and Golan's problematic behavior would establish his guilt.

After a thorough examination of the complex evidence and testimony presented before me, my conclusion is that Golan was able to raise reasonable doubt about this charge. Therefore, I decided on acquittal of Golan in this charge [count # 1] because there is a reasonable doubt.

For avoiding doubt I [the Judge] would like to clarify that my conclusion is that the prosecution failed to prove beyond reasonable doubt the charge that the [inscription] of [James] ossuary is a fake and that Golan or his representatives forged it. This is not to say that the inscription on the ossuary is real and authentic and that was written two thousand years ago. This topic is expected to continue to be investigated in the archeological scientific arena and time will tell. Moreover, it was not proven that the words “brother of Yeshua” necessarily relates to “Jesus” as it appears in the New Testament.

EPILOGUE

The authors of this article present the two opposing scientific views regarding the JO as well as, the remarkable verdict of the Honorable Judge Farkash. We should bear in mind the unfortunate reality according to the IAA (anti-theft department) that 90% of the artifacts in Israel including the West Bank were and are being looted (unprovenanced artifacts). Only 10% of the artifacts really come from official and carefully documented excavations. Should all of these 90% of the archaeological treasures and the history be neglected? Or should these be investigated, debated and eventually added to our heritage as national treasures after being acknowledged by scholars. An automatic rejection of unprovenanced artifacts as advised by many archaeologists is not a mature and responsible attitude.

We [the authors] think that the integrity of the archaeology and the history of our forefathers is truly very important and that the scientific and general community should strive for a fruitful and positive discussion in a free academic atmosphere precluding the politics of

authorities. We should strive for a true scientific debate so the most convincing scientific research will prevail (Barkay, 2008). Judge Farkash encouraged this debate and determined that the artifacts are not at all fakes: “they can well be genuine.” The past belongs to all of us and not only to a small group of archaeologists.

CONCLUSIONS

The “Forgery Trial” sparked a fruitful and important debate on the issue of unprovenanced artifacts by top scientists from all over the world. The conclusions of the Judge regarding the inscription of the James Ossuary contributed much to the forgery debate. By casting doubts on the accusations, the Judge accepted some crucial facts: 1- the inscription was cleaned by a sharp object; 2- there is a real patina covering some letters in the words “Achui d’Yeshua;” 3- statistically the few samples analyzed by the prosecution experts are not sufficient for conviction; 4- the oxygen isotope “expected range” cannot determine forgeries; 5- oxygen isotopic examination of patinas on artifacts is as yet not perfected and cannot be used to determine whether the artifact is authentic; 6- the photos of the ossuary from the 1970s presented to the court are authentic; 7- the casting of the red silicone by the IAA forensic examiners changed the physical condition of the inscription of the ossuary, so much so that Golan’s defense was affected adversely; 8- the judge accepted Professor Krumbein’s statement that “the patina on the ossuary evolved over centuries if not thousands of years, and that the patina within the inscription and the patina on the ossuary were created during the same time period;” 9- the IAA material committee’s conclusions were based on unverified climatic data, incorrect chemistry, ignoring the possible effects of the cleaning, conservation and enhancement of the inscription; 10- the Judge accepts that disqualifying the “Het” sample or other sample, based only on the outcome of its isotopic composition is a “scientific bias or a circular argument;” 11- the ability of the experts from the Royal Ontario Museum, Canada, to distinguish between genuine and pseudo-patina was valid even though Professor Goren claimed otherwise; 12- the IAA material committee came to incorrect and misleading conclusions regarding the discovery of microfossils in the patina. Judge Aharon Farkash’s verdict in the alleged forgery of the James Ossuary inscription clearly contributes more than ever to the strengthening of the contention that the inscription is genuine.

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