A Lecture for AIC Conference 2018: The Tell-Tales Conservation of Two 2,000 Year Old Leather Water-Skins

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1. Intro slide

Good morning everyone.
Hadas and I are glad to be here.
Two of the most important objects displayed in the Israel Museum and of major historical significance to the state of Israel and the Jewish people are two leather water skins dating to 132-135 Common Era., the period of the Jewish Bar Kokhba rebellion against the Roman Empire. The skins were discovered during the 1960 excavation in The Judean Desert, Cave of the Letters, Israel.
Our presentation today will discuss their treatment history by 3 generations: the first treatment in the early 1960's, just after they were found, the retreatment of one of them in 2000 and the most recent retreatment, 2017, of the second one.

2. waterskins- present state

Let's take a look at what the waterskins they look like today, after treatment:

Both are fabricated from an entire vegetable tanned sheep's skin.
These are very large skins, each about a meter long.
The front legs of the animal are held together with a leather band sewn on top with sinew and serves as a handle.
The handle is positioned near the location of the neck, probably used as a counterbalance from which to lift the waterskin.
The neck has been sealed by a round piece of leather and sewn from within.
The hind end of the skin served as the vessel's opening, and was tied with a rope.

Of the two skins, one has an ancient rope from the excavation while the other has a replica.

➔ Look at the amazing original patches made by owners in historic times. These have been sewn on with sinew and ligaments. While some of them are repairs to a torn area of the skin, others are covering natural orifices such as an anal hole or a naval.

3. Original uses of waterskins

Water skins have been used since antiquity as containers for water, wine, oils and other liquids. We still see use of them in nomadic societies in Israel. They could be carried on the back, as can be seen in this photograph from Jerusalem 1895, carried on the sides of an animal, or tied stationary in a domestic environment.

These objects provided an essential utilitarian role as well as reflected monetary value, and therefore were reused even after their original use was no longer facilitated.

In the case of our waterskins, both were found containing important documents and mundane objects. It was assumed that the skins were reused as ancient suitcases, carried into a hideout refuge, in a remote desert cave, under tragic circumstances.

4. Map of Israel and area of Nahal Hever + outside view of cave of the letters

The “cave of the Letters” is located in Eastern Israel, near the Dead Sea, on the cliffs of the Hever Valley, the Judean Desert. In the photo you can identify the 3 openings of the cave, a pretty high and dangerous location to climb to and from.

Despite this remote location of steep cliffs with the extreme weather conditions of very hot temperatures in the summer, an average rainfall of 50mm a year, and arid air, there is archaeological evidence to periodic human habitation in the natural caves of the area since prehistory.

5. **Finds from the cave - story of the hideout during the rebellion**

As archaeological objects connected to the Judean Desert began to appear on the antiquities market in the 1950's, and due to illegal antique trade, David Ben Gurion, then the prime minister of Israel, initiated an emergency governmental act according to which the Israeli army was to aid academic archaeological surveys of the Judean Desert caves, Hever valley included.

In 1961, as part of the said survey, archaeologist Yigael Yadin excavated the "Cave of Letters". Although the cave has been "visited" in modern times prior to Yadin, and even though Yadin was skeptical of future findings, the objects found in the large cave told the tragic story of the Bar- Kokhba rebels from Ein Gedi, the nearest city.

Among the rare finds were 17 skulls in a palm basket,

6. Finds

Bronze utensils, weapons**,** clothing items, weaving supplies, and several vegetable tanned leather water-skins, two of which in nearly complete form. These finds are the remnants of a community of men, women and children, massacred by the Romans by the end of the siege at this location.

7. Papyrus+ Bar Kochba image (modern)

Two historically significant archives, found inside the 2 waterskins and written on papyrus, are important to mention: One is a packet of letters written by Shimon Bar Kokhba himself, the mythological leader of the Jewish rebellion, to his subordinates in hiding, hence the name "Cave of Letters". Shimon bar Kokhba was the leader of what is known as the Bar Kochba revolt against the Roman Empire in 132 Common Era, establishing an independent Jewish state which he ruled for three years. This Jewish state was conquered by the Romans in 135 Common Era, following a two and half-year war.

The other archive known as the Babatha archive, consists of extensive legal documents of a woman named Babatha who probably was in hiding. Both archives are written in Hebrew and could be read by Hebrew speakers today

8. Photo of waterskins as were found

The organic materials found by Yigal Yadin were preserved relatively well under the desert arid conditions in a dark cave.
Black and white photographs from the excavation can be found in the archaeological reports and from these we deduced the condition of the waterskins when found in the cave.
This included:

- Areas of the leather were missing due to decomposition of the organic matter.
- Several pieces of leather were detached and loose
- There were tears and holes in many places, several areas were perforated.
- There are general uneven coloration and stains, possibly the effects of humidity, proximity to soil and other elements of deterioration.
- Skins were misshapen and deformed.
- And, as expected, there was a 2000 yr old dirt and dust layer overall.

9. 1st treatment- 1961

There are no written treatment documents from the 60's, although there are few black/white photos showing stages of the treatment, and we do not know who performed the treatment or at what location.

Upon receiving the waterskins for retreatment, we examined them and concluded that the treatment probably included:

- Surface cleaning
- Reshaping, possibly by humidity, into a 3D body.
- Insertion of a textile inner support made of a heavy, cream colored, curtain like fabric.

10. Details of 1st treatment

- An inner support was stuffed with stiff stalks, raw cotton material, and cotton rags.
- A wooden broom stick, cut to size, was inserted in one of the waterskins to serve as a spine.
- Nylon filament, known commonly as fishing wire, was used to hold down leather pieces, which were either folded or detached, onto the textile support. It is important to mention that no new holes were created in the leather and all threads utilized existing holes.
- The Babatha waterskin was found without a rope. Also, the records clearly state that the rope, which was found adjacent to the Letters waterskin, was placed on it by Yigal Yadin.
- Finally, Plexi mounts were utilized for display purposes.

According to excavation published records, analysis was performed by Dr. M.L.Ryder, then of the University of England, Australia. Dr. Ryder found that the leather is sheepskin while patches are both sheep and goat skin.

Researchers from the Fiber Institute in Jerusalem determined that galls and pomegranates were probably used for the vegetable tanning process. It was also determined at this time that the rope was made of twisted palm fronds.

11. 2nd treatment 2000

In 2000 it was decided to examine the waterskins through a modern conservation approach.

- The waterskins were found flat. In the first treatment both waterskins were reshaped and given volume. When we came to reconsider their treatment, this was not only a fact we could not reverse but also this was already the way generations of Israelis have come to expect these objects to appear.
- The use of a physically intrusive sharp and tight fishing wire was showing damaging signs such as leather tearing and distortions.

- The use of non-conservation grade, acidic materials to stuff the objects was worry some.
- Apart from that, the inner support was stained and aesthetically displeasing as well as dated.

Examination and handling of the leather enabled us to map and sense the fragility, stability, rigidity and frailty of the material. The leather alternates between areas of soft, pliable, thin or perforated to areas which are rigid, thick and darker.
We also observed white blooms and craquelure on the surface.

Following this assessment, it was decided to undertake the retreatment of the Babatha waterskin.

The surface of the leather was cleaned with a soft brush and a HEPA vacuum cleaner.
Next, the reversal of the early 1960's treatment commenced and proved to be fairly easy. Surprisingly, it was compliant with the reversibility ethics of modern conservation.
Fishing wire and embroidery threads were cut and removed.
During this process it was noticed that the threads were holding together folded leather areas and once removed, the waterskin turned out to be larger.
After that it was possible to slowly and carefully remove all filling materials through the open hind end.

Great care was taken in trying to maintain the 3D aspect of the previously treated waterskin so as not to damage any of the dry leather areas and at the same time to keep it ready for new supporting materials.
Take a look at the inflated balloons

After completing the reversal of the 1960's treatment a matching brown cotton fabric was extensively washed and sewn following the pattern of the old inner support. It was then inserted as an inner sleeve from the hind end

of the waterskin, and stuffed with polyester fibers. The back opening was then sewn.

12. Adhesive and rope

The inner support served the purpose of providing volume to the object. However, there still was the issue of holding in place the perforated frail and often non flat leather edges which were held previously with fishing wire. It was decided to adhere frail areas onto the lining with a thick, 30% Klucel G in Ethanol as can be seen in the photos.

Very stiff leather tears were mended with backing patches of Japanese tissue paper pre-tinted with gouache paints.

Upon request of the curator to gather the open hind end with a modern rope, an obviously problematic issue we will not delve into, a dyed modern rope was placed on a fabric band around the leather.
A 2 part Plexi and corrugated board box was constructed for handling and storage.

13. after treatment photos

Here is an after treatment photograph.

17 years later and, due to continuing “reminders” from curator Dudi Mevorach, retreatment of the Letters waterskin finally commenced.

14. 3rd treatment - 2017- before treatment photos

The Letters waterskin exhibited similar condition and treatment method as the Babatha one. Different issues addressed were the state of the original rope including local brittleness and small breaks in the palm fibers, as can be seen in the bottom photo.

15. 3rd treatment - 2017- Taking apart

The reversal process was technically similar to the 2000 treatment. But, due to the fact that the open hind end was very stiff and prone to breakage, extraction of the old inner support was a “C-S” through a large stable loss area in the lower abdomen of the waterskin, rather than a “vaginal” birth, like the Babatha one.
In the photographs we see the stages of the removal of the 1960’s inner support, including the extraction of the broomstick and in the last photograph, the temporary support with Tyvek covered pillows sewn to fit.

16. 3rd treatment - 2017- choices of conservation materials

It was now time to decide what methods and materials to use for the inner support, and the backing for the frail areas.
Should we repeat the 2000 treatment?

We obviously examined the condition of the Babatha waterskin carefully and were happy to find that 17 years later, the treatment was stable.
The Klucel G was still adhering the leather fragments to the support, however, while reversal tests of it with ethanol (as seen in photos) were straightforward, we understood that complete reversal of each and every adhered spot would be complicated and a nightmare. Therefore, we decided that for the Letters waterskin we would support similar areas with backing patches completely detached from the inner support, thus enabling an easier and safer separation in the future.

Reversal tests deemed the Klucel G stable, but slight staining was apparent on the inner side of leather. As we know today, there has been research on cellulose ethers which questions the long term stability of Klucel G. Taking this into account, we tested other adhesives such as:
Lascaux 360HV
Methocel™ and
Paraloid B72 at different concentrations.

Simultaneously, Japanese tissue paper and Reemay® were tested on small detached fragments of the leather for serving as backing materials

A combination of 6% Methocel™ in deionized water and Japanese tissue paper tinted with acrylic paint was chosen because the Methocel did not stain the leather as well as the stability, strength, flexibility and texture of these materials.

17. 3rd treatment- Inner support and patches

A cotton-linen fabric, matching the color of the waterskin, was washed and sewn in the shape of the old lining fabric, with an open area in center of the sleeve for easy access (remember C-S issue?). To support the more fragmentary central area of the waterskin, a rectangle core was carved of Ethafoam ™ and fitted with a Plexi rod at center. This was inserted gradually while padding with polyester fibers around it.

The main disadvantage of the "detachable patches" system was that proper interior access was required to each and every frail area. This meant that the process could not be executed in stages as was done in 2000:
Insertion of inner support
And then the adhesion of frail areas to the support.
In this case, it was all done simultaneously. Frail areas were carefully mapped first, and when needed, were supported on either side by blotter paper and weak magnets as seen in the top photographs. Then, tinted Jap. Paper patches were adhered. The object was gently rotated and supported throughout this venture.

18. 3rd treatment- fastening

After inserting the interior support the open end was stitched with polyester thread.

The open hind end of the water skin needed to be regathered to allow the reinstallation of the treated ancient rope, which was removed during the treatment process to avoid possible damage. While previously the leather was gathered with fishing wire, for this treatment, a fabric belt was made to wrap around and group the leather, allowing for the placement of the rope on top.

19. 3rd treatment- treatment of rope

The fiber breaks in the rope were secured by intertwining and adhering tinted Japanese paper to the strands using 6% Methocel™ in deionized water.

The treated rope was then placed around the waterskin's hind end. As it was not secure in place, tinted Jap. paper loops, anchored the rope to the fabric belt.

20. 3rd treatment- after treatment photographs

These are an after treatment photos of the Letters waterskin.

Alongside the 2017 conservation treatment, we used several contemporary analytical methods in order to assess the analytic results from the 60's regarding the animal identification and the tannage method.

Minute, loose leather pieces were transferred to Prof. Oded Rechavi, Tel Aviv University, to perform computational DNA analysis. The results confirmed that both waterskins were fabricated out of sheep's skin.

The result for the spot test to determine vegetable-tanned leather using iron (iii) sulfate was inconclusive. We suspect it has to do with the age and state of the ancient leather.

21. Summary and comparison

To conclude:

- The treatments of the 2 waterskins were a wonderful and unique opportunity to be able to compare and learn from 3 different conservation approaches throughout the years. Three different teams, of well-meaning professionals, tended to these invaluable treasures. Each team used its knowledge and available materials to the best of their abilities.

- The 1960's treatment practically set the tone for the treatments to follow due to the decision to take the mostly flat waterskins and give them volume. This decision is not a reversible one and treatments which followed had to accept this decision.
- Also, relative to the conservation practice in Israel in the 1960's, this was a conscientious treatment: minimal intervention was done, no lubricants were used, and the waterskins were given a proper support which functioned for 60 years.
- The exchange of support materials into conservation grade materials was an obvious step taken in the second and third treatments.
- However, the significant difference between the treatments was the method and materials used to secure the frail and fragmental areas of the leather. In the 60's it was done with rough fishing wire. In 2000 it was decided to adhere these areas with Klucel G to the modern support inside. This provided excellent aesthetics to the Babatha waterskin, but could eventually complicate reversal in the future.
  In 2017 the aesthetics were slightly compromised: frail sections were backed with patches of tinted Japanese tissue and Methocel. These patches are completely detachable from the inner support. The Letters waterskin, after treatment, looks less gathered and less tightly fitted to the inner support as the Babatha one, but it adheres more to modern conservation thinking and practice.
- And as far as modern conservation practice, today, we probably wouldn't have added to either of the waterskins a modern rope or even an ancient one, although claimed to be found besides it.

22. End slide- us

On a personal note, I received this book 40 yrs. ago for my bat mitzvah. This exciting book, about the Bar Kokhba excavations, was present in every Israeli home in the 70's. Back then I never thought I would ever touch, not to mention treat and be responsible, for the objects in the book. In the professional life of a conservator, we get opportunities to treat objects of special significance, ones that are close to our hearts. This was one of those moments.

Thank you!

23. Thank you:

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