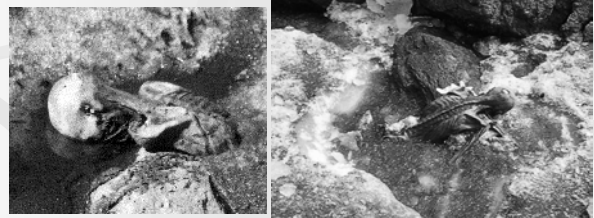


*Paleoforensics:  
Examining the hidden world of ancient remains*

### Ötzi the Iceman

September 19, 1991, German hiker Helmut Simon discovered a human corpse protruding from the Schnalstal glacier near Hauslabjoch high in the Ötztal Alps near the border of Italy and Austria.

Simon initially thought the corpse was that of an unfortunate climber who recently died in the remote mountainous area.



This initial interpretation turned out to be false, as a quiver of arrows and a primitive axe were found nearby.

Remains of the man dubbed "Ötzi" (named after the Ötztal Alps) were later determined (via carbon-14 dating) to be 5,300 years old !

The remarkable preservation of the remains has provided scientists with valuable clues on the activities of ancient humans.

Ötzi in the lab



Even more remarkable is evidence suggesting that Ötzi had not died peacefully.

Let us now look at evidence that can be used to figure out how Ötzi lived and died.

Today, Ötzi resides in a cold-storage vault in the Archeological museum of Bolzano, in Italy. The vault temperature remains at a constant - 6 C, with a relative humidity of 96 to 98 percent.

For investigational purposes the body is removed from storage and put in box with carefully controlled air currents for no longer than 11 minutes at a time.

### Significant Features and What These Tell Us

#### *State of preservation*

Although remarkably well-preserved, muscle tissue and the outer layer of skin have undergone a small degree of decomposition.

This accounts for Ötzi's somewhat wrinkled appearance

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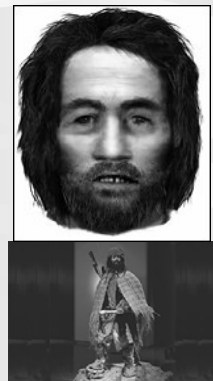
#### *What did Ötzi look like?*

About 5 feet, 4 inches tall

Age at death: between 40 and 50 years old.

Based on bone structure in the skull (especially muscle attachment scars), scientists can reconstruct what Ötzi looked like when he was alive.

Similar methods are used today to reconstruct the appearance of murder victims.



### Tattoos

Closer examination of Ötzi's remaining skin on the back and lower legs revealed distinctive intersecting lines of pigment that appear to have been tattoos.

The tattoos have suggested to some that Ötzi could have been a religious leader.

Others have noted that the positions of the tattoos correspond to acupuncture points for treating back and leg pain (is there a spiritual meaning here ?)



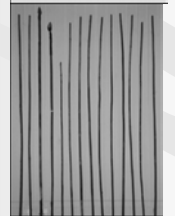
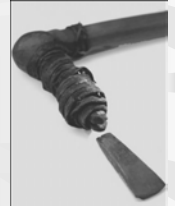
### Tools

Tools found associated with the body included a copper axe, a flint-tipped knife, and a quiver of 14 arrows.

The finding of the axe is significant in that it indicates that humans smelted and manipulated copper in to fine tools well before the traditionally accepted date of about 4,000 years ago.

The handle of the knife was found to be made from ash (a wood that is still used today for its strength).

Curiously, 12 of the arrows lack points, and the remaining 2 are broken.

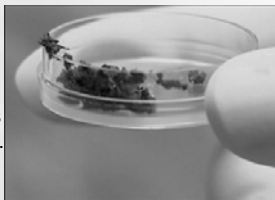


### Ötzi's Gut Contents

A sample of the contents of Ötzi's colon was examined by paleobotanist Klaus Oeggl.

This sample was found to contain pollen from a tree (Hop-Hornbeam Tree) that only grows in the Schnals Valley, located south of the Alps (this tree is known to bloom in late spring).

Modern day shepherds of the Schnals Valley lead their flock through the same mountain pass as where Ötzi was discovered (Ötzi was probably a shepherd)



Also found were remains of einkorn wheat bread, herbaceous material, deer meat.

Because einkorn doesn't grow naturally in Europe, finding it in Ötzi's gut suggests some contact with an agricultural community.

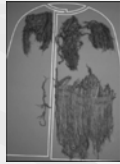
### Clothing

The iceman was found unclothed.

But in his possession were articles clothing made of hide and fur:

1. A grass cloak with a front opening and arm slits (this material was probably used for its water-repellent properties), and a goatskin undercoat
2. Leather leggings and a belt
3. A hat made of bear fur.
4. Hide sandals

This provides the first undisputed evidence of sophisticated clothing from humans of this age.



### An Arrowhead !

Perhaps the most interesting feature discovered in the corpse is a flint arrowhead found lodged in the shoulder (and only a couple of centimetres out from the lung).

No scar tissue appears to have formed around the wound, providing strong evidence that Ötzi died due to the injury.

It is suspected that the arrowhead punctured an artery and that Ötzi bled to death.



### Again, the transfer principle in action !

Minerals found in Ötzi's teeth, bones, and intestines were compared to those found in soil and water samples taken from a wide area of the Tyrolean Alps.

This suggests that Ötzi was most likely born in general vicinity of Bolzano, Italy, but that he lived most of his life in somewhat more northern valleys.

They deduced this by comparing the results of the minerals in his tooth enamel with that in his bones. They also analyzed bits of mica found in his intestines (most likely from grains ground by stone containing mica).

As suggested by other evidence, Ötzi apparently didn't roam far from this area.

### So How Did Ötzi Die ?

Four main possibilities:

1. Hypothermia
2. Murder (Following a robbery or dispute)
3. Ritual Sacrifice

### *Did He Die of Hypothermia ?*

Did Ötzi's ultimate demise involve hypothermia.

Although nearly impossible to prove, two lines of evidence have been put forth:

1. Weather conditions in the Alps (as well as most other mountainous areas) can change dramatically over short spans of time. Perhaps Ötzi got disoriented and fell into an icy pool on the glacier and froze to death ?
2. Although no evidence has been uncovered to prove this, it has been suggested that Ötzi removed his clothes prior to his death in response to the warm sensation commonly experienced by hypothermia victims.

But again, the arrowhead must mean something !

### *Was he the Victim of Robbery-Related Murder ?*

It has been suggested that Ötzi was a shepherd.

Was he murdered while shepherding his animals through an alpine pass ?

The placement of the arrow in Ötzi's back might suggest that he was running away from an attacker.

Was Ötzi ambushed by copper-age "rustlers" ?

### *Was he the Victim of Dispute-Related Murder ?*

It has been claimed that Ötzi's joints to little wear and tear to suggest that he was a "commoner"

Was Ötzi a more privileged member of society who did not perform strenuous chores ?

Maybe he made some enemies ?

### *Ritual Sacrifice ???!*

It has been suggested that the adornment of Ötzi's body with tattoos and the tools associated with the body are signs of ritual sacrifice.

Ötzi's quiver was found to contain 12 blank shafts and two finished (but broken) shafts.

Ancient Europeans are alleged to have broken objects in religious ceremonies (perhaps the broken arrows point to some sort of ritual killing ?)

Could the tattoos have been applied as part of a religious sacrifice ceremony ?

Negative evidence: Ötzi's knife would have been a valuable item. If Ötzi was murdered, why would the attacker have left the knife behind ?

*More Recent Issues*

1. In addition to the arrow wound, cuts have been found on Ötzi's hands, wrists and and ribcage

2. Additional blood was found on Ötzi's back: was this from another individual ?



3. How was the shaft of the arrow removed ?

4. Ötzi's grip fits perfectly with the dimensions of his knife (it was later noted that the knife was dislodged when the frozen corpse was removed from glacial ice).

*Final possibility: Did Ötzi die in battle ?*

*A bizarre twist of fate: The curse of the Iceman ?*

Helmut Simon was found dead in the Austrian Alps eight days after he had failed to return from a mountain hike.

Searchers were preparing to suspend their work, when a hunter discovered Simon's body in a stream.

He apparently died after a 300 foot fall on Austria's Gaiskarkogel peak.

Rescuers said Simon was probably hiking along an unmarked path when he plunged 100m to his death. He is believed to have died instantly.

*END OF LECTURE*