

# ÖTZI

## REAWAKENED:

### *New Research on the Oldest Mycophile*

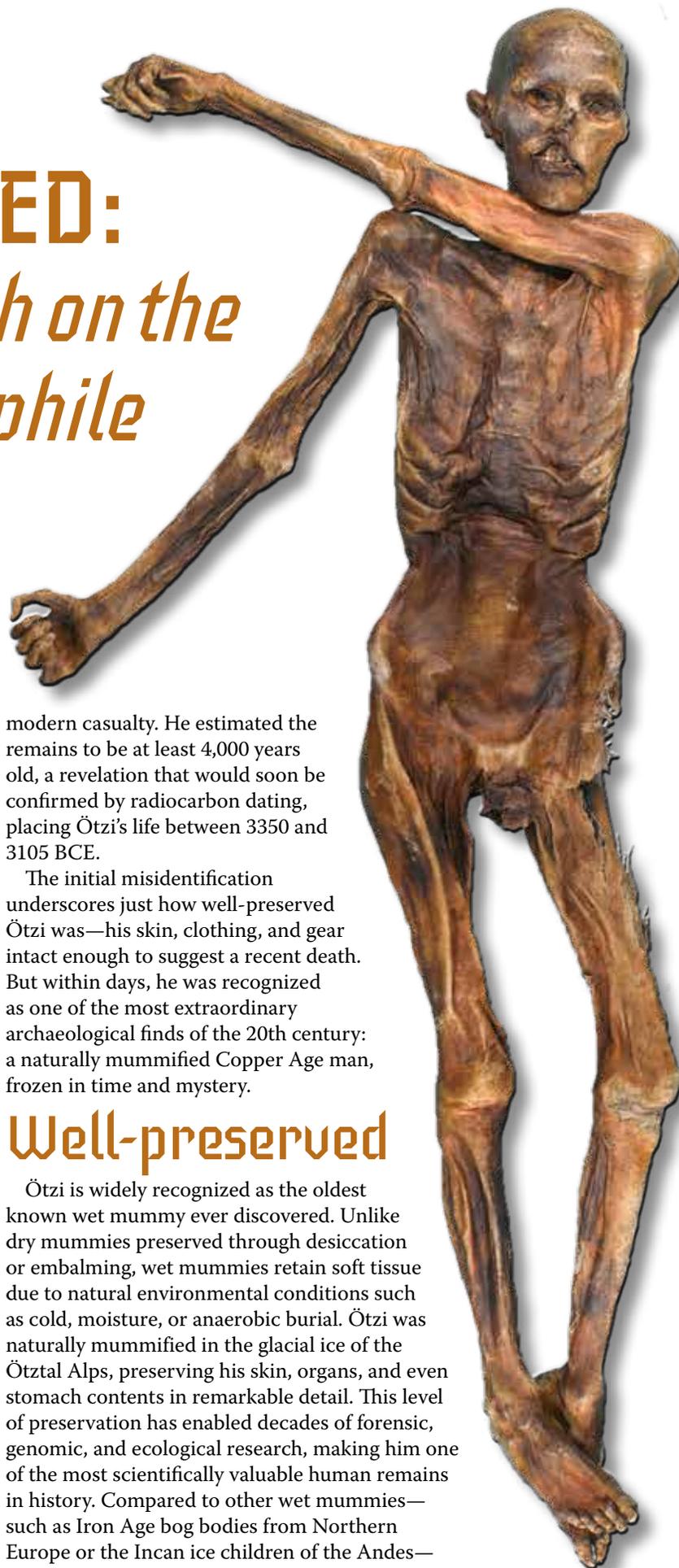
*Britt A. Bunyard*

**I**N 1991, a body emerged from the ice near the Tisenjoch pass in the Ötztal Alps—a man frozen mid-stride, his skin leathered by time, his tools still clutched in death's grip. Dubbed Ötzi the Iceman, he was quickly recognized as Europe's oldest known natural mummy, dating to around 3350–3105 BCE. But Ötzi is no static relic. He is a recursive archive—his body, gear, and microbiome are continually being reinterpreted by scientists. Over the past few years, a wave of new research has reframed Ötzi not just as a prehistoric wanderer, but as a genetic outlier, a fungal technologist, and a witness to the long migration of agriculture and metallurgy across the continent.

## The Discovery

Ötzi was discovered on September 19, 1991, by two German hikers, Erika and Helmut Simon, while descending from the Finail peak in the Tisenjoch area of the Ötztal Alps, near the Austrian–Italian border. They had veered off the marked trail and noticed something brown protruding from the ice—a human figure partially embedded in the glacier. At first glance, the Simons and later local authorities assumed the body belonged to a recently deceased mountaineer, perhaps someone who had succumbed to exposure or a climbing accident in the previous decades.

The body was difficult to extract due to its frozen state and the high-altitude conditions—over 10,500 feet above sea level. After several days of effort, it was finally removed and flown by helicopter to the town of Vent, then transferred to the Institute of Forensic Medicine in Innsbruck. It was there that archaeologist Konrad Spindler examined the artifacts found with the body—most notably a copper axe—and realized that this was no



modern casualty. He estimated the remains to be at least 4,000 years old, a revelation that would soon be confirmed by radiocarbon dating, placing Ötzi's life between 3350 and 3105 BCE.

The initial misidentification underscores just how well-preserved Ötzi was—his skin, clothing, and gear intact enough to suggest a recent death. But within days, he was recognized as one of the most extraordinary archaeological finds of the 20th century: a naturally mummified Copper Age man, frozen in time and mystery.

## Well-preserved

Ötzi is widely recognized as the oldest known wet mummy ever discovered. Unlike dry mummies preserved through desiccation or embalming, wet mummies retain soft tissue due to natural environmental conditions such as cold, moisture, or anaerobic burial. Ötzi was naturally mummified in the glacial ice of the Ötztal Alps, preserving his skin, organs, and even stomach contents in remarkable detail. This level of preservation has enabled decades of forensic, genomic, and ecological research, making him one of the most scientifically valuable human remains in history. Compared to other wet mummies—such as Iron Age bog bodies from Northern Europe or the Incan ice children of the Andes—

Ötzi predates them all by millennia. His status as the oldest wet mummy not only marks a milestone in archaeological discovery but also opens a rare window into Copper Age life, technology, and trauma.

Ötzi the Iceman has been studied and preserved primarily at the South Tyrol Museum of Archaeology in Bolzano, Italy, where he has resided since 1998. This museum was specifically outfitted to house his remains in a custom-designed cold cell that mimics the glacial conditions in which he was found—maintaining a temperature of  $-6^{\circ}\text{C}$  and 98% humidity to prevent decomposition. Visitors can view Ötzi through a small window, while his clothing, tools, and other artifacts are displayed in a permanent exhibition that spans an entire floor. WOULD YOU LIKE TO SEE ÖTZI IN PERSON? JOIN ME IN 2026; SEE SIDEBAR FOR DETAILS.

## Research and Discoveries

Scientific research on Ötzi has been conducted by a wide array of institutions, including EURAC Research (Institute for Mummy Studies), which has led many of the forensic, genomic, and pathological investigations. Collaborations have also included universities and labs across Europe, contributing to studies on his DNA, microbiome, diet, and cause of death. Ötzi's preservation and study represent one of the most interdisciplinary archaeological efforts in history—spanning anthropology, paleogenomics, climatology, and even mycology.

Ötzi the Iceman bears the oldest known tattoos in human history, etched into his skin over 5,300 years ago. Researchers have identified 61 distinct tattoos, grouped into 19 clusters across his body—including his lower back, knees, ankles, wrists, and ribcage. These tattoos are not decorative in the modern sense; they consist of simple lines and crosses, likely made by cutting the skin and rubbing in charcoal, a technique that left dark, enduring marks even on his weathered, mummified flesh.

What makes Ötzi's tattoos especially compelling is their therapeutic placement. Many align with areas where he suffered from joint degeneration

and spinal pain, suggesting they may have served a medicinal or diagnostic purpose—akin to proto-acupuncture. For instance, the tattoos on his lower spine and knees correspond to known acupuncture points used to treat back pain and arthritis.

Advanced multispectral imaging was required to detect many of these tattoos, as Ötzi's skin had darkened over millennia, obscuring the ink from the naked eye. This imaging revealed previously unseen tattoos, including one on his chest that may have been applied to treat respiratory discomfort.

## Diet

When Ötzi the Iceman was discovered in 1991, frozen in the Ötztal Alps and preserved for over 5,300 years, his body offered an unprecedented glimpse into Copper Age life. But it was not only his tools, tattoos, or genetic lineage that captivated researchers—it was his stomach. In 2009, scientists located Ötzi's stomach, which had shifted upward during mummification, and began a forensic reconstruction of his final meal. What they found was not a symbolic offering or ritual feast, but a pragmatic, high-calorie composition tailored for survival in the alpine wilderness.

Ötzi's last meal consisted primarily of ibex meat and fat, making up nearly half of his stomach contents. The meat was likely dried or roasted, and the fat—dense and energy-rich—suggests a deliberate choice for endurance. Alongside the ibex were traces of red deer, another protein source, and einkorn wheat, one of the earliest domesticated grains. This ancient cereal may have been consumed as a coarse bread or porridge, providing carbohydrates to balance the heavy intake of fat and protein. Intriguingly, researchers also found remnants of bracken and fiddlehead ferns, wild greens that may have been foraged or used as wrapping material. Some of these ferns are toxic if improperly prepared, raising questions about Ötzi's botanical knowledge or desperation.

The meal paints a portrait of a man on the move—perhaps fleeing, hunting, or ascending into the mountains with purpose. Its composition reflects not just nutritional strategy but ecological intimacy: a diet shaped by terrain,

## 2026 Whatscookin' Italy Myco Tour of the Dolomites

Nestled in the heart of South Tyrol, Bolzano serves as the western gateway to the Dolomites—a UNESCO World Heritage Site renowned for its jagged limestone peaks, alpine meadows, and dramatic seasonal light. The region's unique blend of Italian and Germanic cultures is reflected in its architecture, cuisine, and bilingual signage, offering visitors a rich cultural tapestry alongside breathtaking natural beauty. Tourists flock to Bolzano and the surrounding Dolomites for world-class hiking, skiing, and climbing, as well as scenic drives along the famed Great Dolomites Road. Culinary traditions here are equally compelling: speck, knödel, and mountain cheeses meet Mediterranean flavors like porcini risotto and fresh trout, often paired with crisp local wines.

Just south of Bolzano lies the village of Tramin, the birthplace of Gewürztraminer—one of the world's most aromatic white wines. Tramin is perched along the South Tyrolean Wine Road, surrounded by sun-drenched vineyards and orchards. With over 300 days of sunshine annually and views of Lake Caldaro shimmering nearby, Tramin invites travelers to savor not just its wines but its cobbled streets, Gothic church towers, and festive culinary spirit rooted in centuries of alpine tradition.

Our tour in September 2026 will begin and end in beautiful and historic Verona and, oh yes, will include an up close and personal meeting with Ötzi in the museum in Bolzano. For details email me or check out our website at [www.whatscookin.it/dolomites26](http://www.whatscookin.it/dolomites26). 🍄

season, and survival. The high fat content suggests an understanding of caloric density, essential for high-altitude exertion. Moreover, the presence of wild plants and ancient grains reveals a fusion of foraging and early agriculture, a transitional moment in human subsistence.

Beyond this final meal, isotope and protein analyses of Ötzi's tissues suggest a broader diet rich in meat, grains, and wild plants, consistent with early Neolithic communities in the Alps. He was lactose intolerant, and there is no evidence of dairy consumption, reinforcing the idea that milk had not yet become a dietary staple in his region. His teeth show signs of wear and periodontal disease, but no cavities—likely due to the absence of refined sugars.

## Recent Research and Discoveries

**Anatolian Ancestry and Genetic Isolation.** A 2025 paleogenomic study published in *Nature Communications* analyzed the genomes of 47 individuals from the Eastern Italian Alps (6400–1300 BCE), including Ötzi himself. The results revealed that Ötzi's genome is overwhelmingly composed of Anatolian farmer ancestry—up to 90%, linking him to Neolithic populations that migrated westward from present-day Turkey (Croze et al., 2025).

Despite this shared ancestry, Ötzi's Y-chromosome (G2a-Z6208) and mitochondrial DNA are unique, found in no other known ancient or modern populations. He is both emblematic and singular—a man whose blood remembers a continent's transformation, yet whose lineage vanishes into glacial silence.

The study also suggests a patrilineal social structure in the Alps, where men remained in their birth communities while women migrated between groups. This pattern explains the low diversity in Y-chromosome lineages and the high diversity in mitochondrial DNA, reinforcing Ötzi's genetic isolation.

**Copper from Tuscany: Metallurgy and Trade Networks.** Ötzi's copper axe—once thought to be locally

sourced—has now been traced to mines in Southern Tuscany, according to a 2024 metallurgical study in *Scientific Reports* (Artioli et al., 2024). This discovery reveals long-distance trade routes and metallurgical knowledge spanning Central Europe during the Copper Age.

The axe itself is a technological marvel: a cast copper blade hafted into a yew handle, showing signs of use and repair. It's not just a weapon—it's a symbol of status, skill, and connectivity. This Tuscan provenance reframes Ötzi as part of a broader metallurgical culture, one that moved materials and ideas across mountainous terrain.

**Fungal Technologies and Fire Ecology.** Among Ötzi's most enigmatic possessions were two species of fungus: *Fomitopsis betulina* (birch polypore) and *Fomes fomentarius* (tinder conk). These weren't incidental forest finds—they were curated tools in his survival kit.

Birch polypore is known for its antibacterial and antiparasitic properties, it may have been used to treat Ötzi's whipworm infection (Maixner et al., 2016). Its dense flesh also makes excellent tinder and blade strops.

Tinder conk also is a significant find. The amadou layer of *Fomes fomentarius* can smolder for hours, ideal for transporting fire across alpine terrain. Ötzi wrapped this fungus in green maple leaves, likely to insulate embers and regulate combustion (South Tyrol Museum of Archaeology). This fungal-leaf duet reveals a sophisticated fire ecology—Ötzi wasn't just starting fires, he was carrying them for future use.

**Health, Appearance, and Microbial Echoes.** A 2023 high-coverage genome analysis in *Cell Genomics* refined Ötzi's physical and health profile found he had dark skin and hair (Wang et al., 2023). This contradicts earlier reconstructions of him; Ötzi likely had darker pigmentation. Ötzi had lactose intolerance, just like many humans today. This reinforces the idea that dairy wasn't yet a dietary staple. He also had other health risks familiar to us today. Research has shown he had a genetic predisposition to adult-onset diabetes, obesity, and male pattern baldness.

His gut also revealed traces of cold-adapted fungi like *Pseudogymnoascus destructans*, suggesting environmental exposure and microbial resilience

(Oskolkov et al., 2024). (This fungus causes bat white-nose disease and has been reported in FUNGI over the years.)

**Death, Deposition, and Seasonal Clues.** A 2023 study in *The Holocene* reexamined the glacial context of Ötzi's death. While he was long thought to have died in autumn, new evidence suggests late spring or early summer (Pilø et al., 2023). Glacial movement and melt cycles may have altered the burial context, complicating interpretations of his final moments.

Ötzi's cause of death remains violent: an arrow wound to the shoulder, defensive injuries, and a head trauma suggest ambush or conflict. But the seasonal shift adds nuance—he may have been migrating, hunting, or fleeing when he was struck.

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# ÖTZI's milieu

**BIRCHBARK:** *Used to make birchbark containers*

**BIRCH TAR:** *Used as glue and sealant*

**POPPY:** *Grown to produce oil*

**GRAINS:** *Einkorn, Durum Wheat and Barley*

**MUSHROOMS:** *Harvested for food, medicine and tinder*

**BERRIES:** *Sloeberry, Raspberry and Blackberry*

**LIVESTOCK:** *Goats, Sheep and Cattle*

**WILD GAME:** *Red Deer and Brown Bear*

**CLOTHING:** *Made from leather, wood and grass*



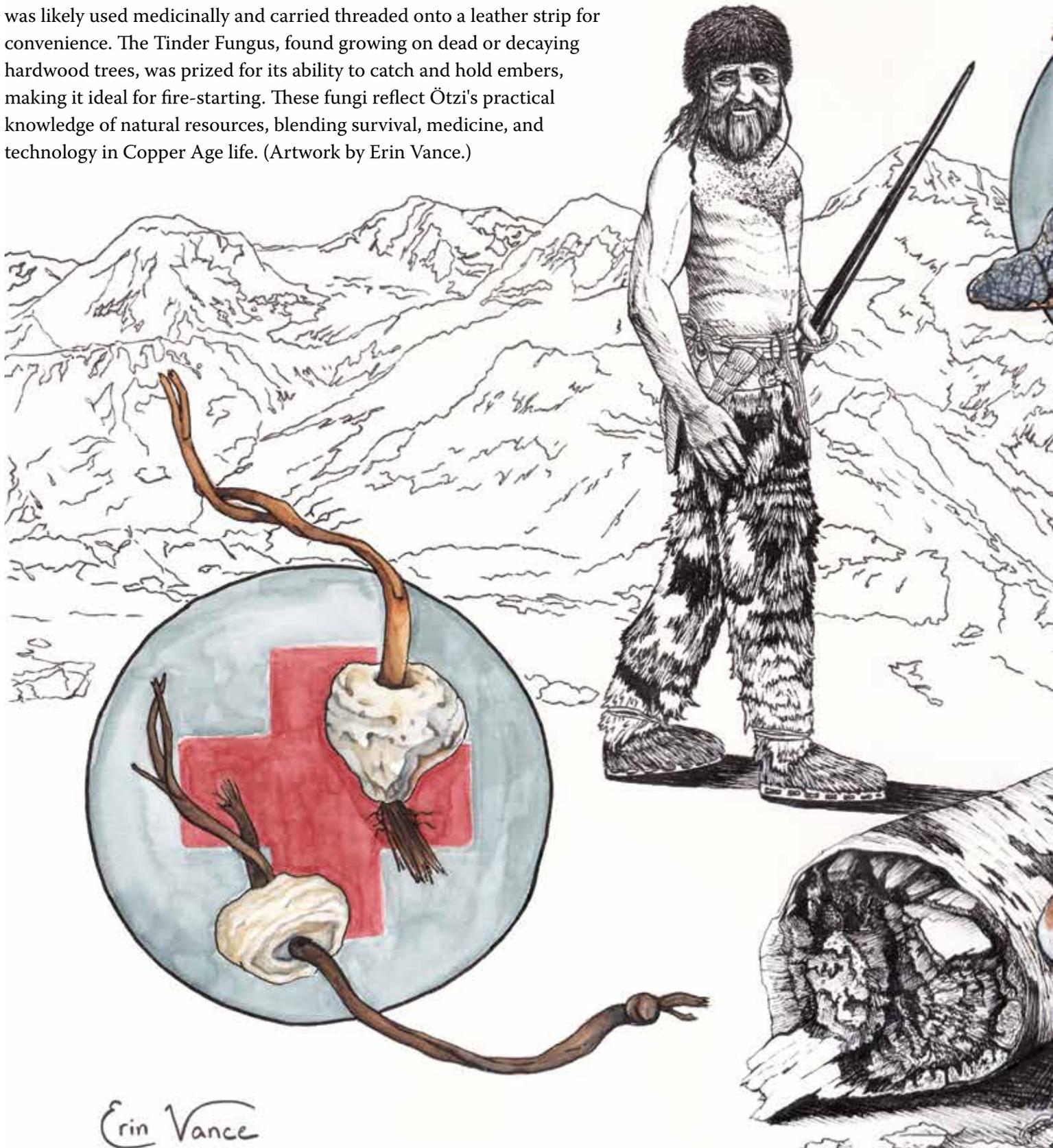
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# Fungi in the Iceman's Arsenal

Ötzi the Iceman carried two notable fungi: *Fomitopsis betulina* (Birch Polypore) and *Fomes fomentarius* (Tinder Fungus). The Birch Polypore, known for its antibacterial and anti-parasitic properties, was likely used medicinally and carried threaded onto a leather strip for convenience. The Tinder Fungus, found growing on dead or decaying hardwood trees, was prized for its ability to catch and hold embers, making it ideal for fire-starting. These fungi reflect Ötzi's practical knowledge of natural resources, blending survival, medicine, and technology in Copper Age life. (Artwork by Erin Vance.)



Erin Vance

