

Discover **COPPER**

Copper Connects Life.™

Edition #14

An
Ancient
Copper
Treasure
Map

The accidental discovery of the Dead Sea Scrolls in 1947, by a Bedouin goat-herder from Qumran near Jerusalem, gave archeologists a window into the past and religious scholars important clues to the creation of the Bible. Excavations eventually revealed some 850 documents, including portions of the Old Testament written on leather and papyrus, dating back to the second century BC.

One scroll stands out from the rest. In cryptic language inscribed on a thin copper sheet, this scroll contains what many experts believe to be a treasure map, complete with detailed directions to where a fortune in gold and silver are hidden.

The copper scroll was discovered in 1952 in what it is now known as Cave 3 at Qumran. Analysis showed that it is composed of copper alloyed with a small amount of tin. Researchers initially thought there were two separate scrolls, but after cutting the scroll apart for examination, they now believe the thin metal snapped two centuries ago.

THE SECRETS OF THE SCROLL

Mystery surrounds this scroll and its contents, as scholars cannot agree on the translation of the text. The scroll is written almost entirely in Mishnaic Hebrew, although it includes several entries written in Greek. A further complication is that the text contains words and references the experts simply don't understand. Most early Hebrew texts are religious in nature and contain a distinct vocabulary.

Continued on page 4**The Serious Cook's Metal of Honor**

"There's an intense interest in culinary arts now," says John Milnthorp, business manager for the clad metals division of All-Clad Metalcrafters, which sells millions of dollars a year in copper cookware. The advent of an entire cable TV network, the Food Network, is certainly proof of the increased attention given to food preparation.

Along with this attention has come a substantial increase in copper cookware purchases. Copper provides the foundation for many gastronomic delights, including delicate sauces, candies and chocolate.

Copper's superior ability to conduct heat is an essential component of quality cookware. Used as an exterior base for pots and pans, copper is preferred by professional as well as amateur chefs who value its thermal properties. As a bonus, copper cookware offers the additional advantages of natural, aesthetic beauty and durability. Quick, uniform heat transfer across the bottom and sides of a pot or pan can make the difference between a light sauce and a lumpy paste. "The even distribution of heat cooks foods uniformly near the top of the pot as well as at its bottom — and it cooks them quickly, so there is minimal drying of moist foods," explains Cecile Lamalle in an article for **The Cooks** magazine.

"Copper is the best cooking equipment you can have," claims Henri Boubee, former corporate executive chef of Ritz-Carlton Hotels. "It heats uniformly, holds the heat best, and cooks the quickest."

Evenly distributed heat helps when preparing difficult dishes, such as crepes and delicate sauces like Béarnaise and hollandaise. With this and other sauces, if some parts of the pot are hot and other parts cool, continual stirring is required to even out the heat, otherwise the sauces separate or lose flavor. "But due to copper's fabulous thermal conductivity, you don't have to pay constant attention to the pot and you can still get a great sauce," says Milnthorp.

Copper pots are also excellent for sautéing and stir-frying.

COPPER'S "A NATURAL"

"At the top of the list of what people want today is 100 percent mother nature," says Jeffrey Herkes, owner of Hammersmith Corporation, another copper cookware manufacturer. "Copper (for the exterior), tin (for interior lining) and brass (for handles) are pure and natural. They are inert and do not react to foods with acids or bases." Brass handles are chosen for beauty and because brass, a copper and zinc compound, doesn't rust.

Continued on page 2



A cross-section of a saucepan with a copper exterior. Copper's superior thermal conductivity makes it an ideal choice for cookware.

"There's also more interest in product durability and longevity. Copper is recyclable and renewable," says Herkes. Hammersmith makes copper cooking utensils by pouring the molten metal into a mold, then hand-wiping tin on the interior cooking surface. The company will reline the tin surface of the cookware when it wears down, typically, in about 15 years.

Copper must be lined with another substance — often tin or stainless steel — because copper may react with acidic foods, such as red sauces and citrus juices, resulting in potential food discoloration and intestinal malaise. Tin is a better heat conductor than stainless steel, but tin wears out over time and melts when subjected to high temperatures (425°F or higher) and has to be relined.

On the other hand, unlined copper is perfect for whipping up cream and egg whites and for the candy and confectionary industries that use sugary, nonacidic ingredients, according to Herkes. Chocolate, caramels, jams and jellies are stirred in huge, copper kettles that offer easy, precise temperature control.

Occasionally, Hammersmith will line copper with silver for "preferential chefs" who want the expensive lining for mixing bowls, such as for making zabaglione or Italian pastry.

Hammersmith also makes "hammered" copper cookware with small indents. "This hardens the metal and lets the heat travel even faster," he states. Hammersmith custom-designs utensils upon request, such as a sauté pan with taller sides.

A KITCHEN GEM

Beautification of the kitchen also drives the purchase of copper cookware. The bright glow of copper pots and pans adds panache to a room where, formerly, stylishness didn't count for much. "Their sheer beauty is very elegant — almost like jewelry for the kitchen," Milnthorp states. Copper's warm reflective shine is also the reason it is used for chafing dishes and food warmers — it imparts a sense of sophistication to food service.

All-Clad sells two copper cookware lines. The 20 year-old Cop-R-Chef line of pots,

pans and skillets is clad with a copper exterior, lined with aluminum and has a stainless steel cooking surface. Because the copper is so beautiful, "some people buy a set, hang it in the kitchen and don't use it," says Milnthorp.

A newer line, Copper-Core, is comprised of stainless steel on the interior and exterior cooking surfaces, with a layer of copper in between. An aluminum layer seals the copper, preventing oxidation. A patented design peels away a ribbon of stainless steel, enabling a gleaming band of copper to shine through the exterior surface (see illustration). This line is popular because it is easy to clean while maintaining the conductive and aesthetically appealing advantages of copper.

Copper is generally purchased by those who are artisans in home and professional cooking. "People who are discerning use copper," states Milnthorp. Herkes adds, "Copper is the cook's Metal of Honor."

HISTORY

Cooking utensils have been made from copper for more than 3,000 years, since the Bronze Age, according to Jeffrey Herkes, owner of Hammersmith, which manufactures copper cookware in Brooklyn, New York. Aside from copper being a great heat conductor, our ancestors just didn't have much else to cook in, he adds.

Herkes recreated cookware used by American settlers for Colonial Williamsburg, the historical theme park in Virginia. During the 1760 to 1810 period, large copper pots were placed on the fire and left to heat all day, blending together all the ingredients for stews and casseroles. Until the Industrial Revolution, these utensils were made by rolling out a sheet of copper, hammering it into the shape of a pot over an anvil, and pouring a tin sheathing into it.

Because copper pots last so long and are a prized heirloom, Herkes has seen pots and pans 90 years old — some made long ago by his own company — come back to Hammersmith generations later to get retinned. "No one throws them away," he says. **Cu**

Keeping Copper Cookware Bright

Uncoated copper oxidizes and quickly tarnishes, so if you want to keep that warm bright glow, on copper cookware, some degree of care is required.

Wash pots and pans with soap and warm water, rinse and use a soft cloth to dry right away; moisture makes copper tarnish faster. Never use abrasive cleansers or steel wool, because copper is a soft metal and they will scratch the surface. Washing in a dishwasher is not advised, as harsh detergents will darken copper.

To remove tarnish, use a commercial polish or make your own. Several "home" remedies are recommended:

- Make a paste from equal parts salt, vinegar and flour. Rub the copper with this mixture (as with any polish, a circular motion is recommended) then wash the pot carefully, rinse thoroughly and dry.
- Dip half a lemon in kosher salt — (which has large, coarse granules), then use the lemon to rub the copper surface. When the tarnish disappears, use a soft cloth to polish the copper with beeswax for a lasting shine.
- Boil copper utensils for several hours in a pot of water containing one tablespoon of salt and one cup of white vinegar. Afterward, wash the items with soap in hot water, rinse and dry.
- If copper is tarnished, boil article in a pot of water with 1 tablespoon salt and 1 cup white vinegar for several hours. Wash with soap in hot water. Rinse and dry.

To keep tarnish at bay, spray with a brightening product (commercial copper or brass polish), dust occasionally and wipe the utensil down with a cold, damp cloth.

Of course, you may prefer the "rustic" look of careworn, tarnished copper. Many cooks and homeowners allow their copper pots or ornaments to darken naturally and develop a green patina that adds an authentic "country" touch to a kitchen.

Additional copper cleaning recommendations can be found at: www.copper.org, www.doityourself.com, ask.yahoo.com and www.howstuffworks.com.

An Extension Cord to MARS

The oceans cover more than 70 percent of the planet's surface. Reaching a maximum depth of almost seven miles, they are home to an abundance of sea life, volcanoes and even mountain ranges that dwarf the Himalayas. We have only begun to unravel the mysteries of the deep, and may actually know more about the realms of space than about our own seas. But that may change thanks to copper and the debut of the Monterey Accelerated Research System (MARS), the first electrically powered deep-sea observatory located off the continental United States.

MARS is the brainchild of California's Monterey Bay Aquarium and Research Institute (MBARI). Funded by the National Science Foundation, MARS relies on a 32-mile "extension cord" using a copper sheath to provide electrical power for up to eight research experiments 2,923 feet below the surface of Monterey Bay.

WHY ALL THE ATTENTION NOW?

Most deep-water experiments are conducted far from land, but thanks to Monterey's unique geography, MARS is located relatively close to the shore. Still, a major problem faced by the engineers who designed the project was how to provide adequate, reliable power for its sophisticated electronic equipment. Batteries are used to power most underwater research electronics, but the location and depth of the MARS platform would make replacing batteries extremely difficult.

Another obstacle was how the scientists would collect information gathered by the equipment. Information would have to be

stored and later retrieved, and real-time data collection would be impossible. The solution to powering the station was a technology that had been in use since the 1800s — an undersea electric copper cable.

Copper has been effectively used in underwater transmission cables for more than 150 years. The first permanent transatlantic telegraph cable laid in 1866 consisted of seven copper wires coated with a natural latex and surrounded by 18 strands of iron wiring for added strength and protection. Since then, the need for underwater electric and power transmission cables has grown exponentially. Today, underwater cable manufacturers almost exclusively rely on copper to meet their power transmission needs.

MARS TO THE RESCUE

MARS relies on a central science node which acts as an interface between the power cable and the experiments. The node contains eight Nautilus connection ports, the standard interface for ocean-based electronics, where each piece of electronics can plug-in for power and data transfer. Additional extension cables are in development to allow experiments to take place two miles away from the node. The first group of experiments for MARS will focus on four areas of study: climate change, food transport to deep sea, sounds in the sea and underwater earthquakes and landslides.

THE POWER OF COPPER

Slightly thicker than a garden hose, the cable was laid under the seafloor using traditional methods. The cable was placed three feet below the seafloor to reduce the pos-

sibility of entanglements with anchors and fishing nets. Once the cable was laid, it was attached to the science node using one of the MBARI Remote Operated Vehicles (ROV). The ROV will also be used to attach the experimental equipment to the science node.

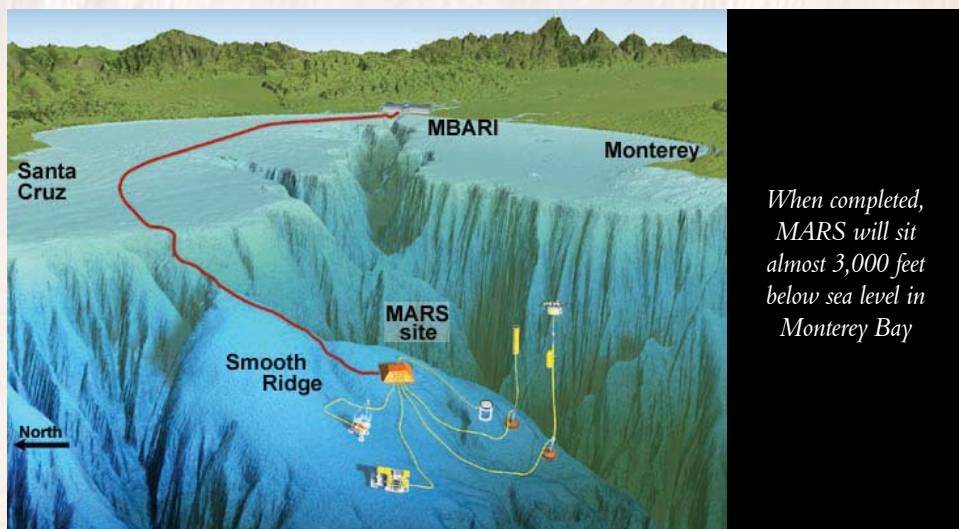
The 32-mile cable is based on the design of cables used for long-haul submarine telecommunications. It consists of eight optical fibers for data transport inside a polybutylene terephthalate sheath surrounded by a layer of stranded high-strength steel wire. The strand of steel wires is encased inside a 0.65 millimeter copper tube or sheath that protects the data transfer components and, more importantly, conducts electricity. This bundle is encased in polyethylene insulation, protecting the components from water and electrical surges. The diameter of the entire cable is only 17 millimeters.

The protective and conductive copper sheath is made from 21 gauge, 100 percent virgin copper. The MARS cable will carry 10,000 Watts of electricity directly to the science node. The high voltage present minimizes power loss as electricity moves through the 52-km (32-mile) sea floor cable. Within the science node, transformers convert the high voltage to an instrument-friendly 375 or 48 volts of dc. By using high voltage in conjunction with a high-gauge copper, current is reduced, limiting the temperature and heat generated from resistance of the electrical flow in the copper. Approximately 50 lbs. of copper is used in the 32-mile cable.

CONCLUSION

Monterey Bay is one of the most biologically diverse waterways in the world, home to a variety of aquatic wildlife, and it is situated along the migratory path of Gray and Humpback whales. In addition, the California coast lies along an active continental plate. Millions of years of tectonic movement have created a shelf just a few miles offshore, where the ocean depth drops from a few fathoms to over 12,000 feet. With so many distinctive features, the Bay is an ideal locale for research into the ocean's geography and ecosystem.

With the cable now in place, testing is underway, and MARS is set to go online by the end of 2007. Scientists are now beginning to design the second wave of experiments which includes research into bioluminescence, chemosynthesis and wave flow. A new world awaits discovery, thanks to the "power" of copper. **Cu**



When completed, MARS will sit almost 3,000 feet below sea level in Monterey Bay

The copper scroll is not religious and includes words and phrases not found in any other ancient text, making an accurate translation difficult and leaving the door open to wide interpretation.

Scholars have identified 63 separate entries on the copper scroll that describe the location of what is estimated to be more than 160 tons of hidden gold and silver. However, the translations are vague and unspecific. One entry describes a treasure to be found "In the gutter in the bottom of the tank." Another entry refers to 65 gold bars located "In the cavity of the Old House of Tribute, in the Chain Platform." Historians do not recognize these reference points and don't know where to begin searching for the treasure.

According to Theodore Gaster, author of *The Dead Sea Scriptures*, there are four prevailing, but contested, theories behind the treasure of the copper scroll:

- The treasure was the property of the residents of Qumran. However, some scholars believe that the community was a religious cult that would have shunned material wealth.
- The treasure represents the antiquities recovered from the destruction of the Second Temple of Jerusalem in 70 AD. Josephus, a first century historian, states that those treasures were still in the building at the time of its destruction and were not removed for posterity or safekeeping.
- The copper scroll refers to the treasures recovered from the First Temple of Jerusalem, destroyed by the Babylonian King Nebuchadnezzar in 586 BC. This is also questioned because the Temple was destroyed 500 years before scholars believe the text was written.

- The copper scroll is a hoax and there is no lost treasure waiting to be found.

SCROLLS TO BE EXHIBITED HERE

Portions of the Dead Sea Scrolls, including the copper scroll, will soon be on display in the United States. The San Diego Natural History Museum will show them from July until early 2008, and other cities including San Francisco will host the exhibit through 2009.

Intrigued by a map traced on a metal sheet, archaeologists, scholars and treasure hunters have searched for the copper scroll's lost gold and silver, but they have yet to discover the key that will help them find it — if the treasure even exists. Still, a half-century after the first clue was unearthed, excitement continues to grow over what may be hidden in the desert north of Jerusalem. **Cu**

The Scent of Cents

The next time you smell something funny on your skin after you've handled pennies, don't blame it on the copper — that *eau de metal* is actually coming from you.

Researchers tested the effects of various metals on human skin and found that what smells is not the metal, but the rapid interaction of skin oils with iron, copper and brass. The chemical reaction causes new, strongly scented gaseous compounds to form.

Research conducted at Virginia Tech has demonstrated that vapors emanating from the skin of people who handled iron were shown to contain aldehydes and ketones, both organic chemicals that give off strong odors. For example, acetone is the active ketone found in pungent-smelling nail polish remover.

Tests by Andrea Dietrich, in collaboration with Dietmar Glindemann of the University of Leipzig, Germany, show that skin oils react by forming different compounds when we touch various metals. The researchers postulate that everyone produces slightly different odors, and those odors may change if a person has a disease, such as cancer. In such instances, the variations in the scents could become a useful medical diagnostic tool.

"We're working to see if the smell caused by iron on skin provides a fingerprint of disease," says Glindemann.

On a more prosaic level, Dietrich adds that this research also may lead to innovative methods for eliminating the metallic taste often found in drinking water. **Cu**

Hiding Wires in Plain Sight

Unsightly electrical and communications wire bundles are a common problem with complex home entertainment systems, lighting and many other connections. An innovative new product, FlatWire from the Southwire Company, offers a solution.

FlatWire features wafer-thin low voltage copper conductors insulated by a polymer film. This product is so thin it can be installed on any flat surface and then painted or wallpapered over, rendering it virtually invisible. It offers wiring and interconnect devices for a variety of applications including lighting, audio and loudspeakers, voice/data lines, high performance video, and Cat 5, 5e and 6 data cables.

To learn more about FlatWire, visit the Southwire website at www.southwire.com. **Cu**



FlatWire speaker cable



Recent research shows that the smell you may get from handling coins doesn't come from the metal but from oils in your skin.

RESOURCES:

This edition of *Discover Copper* is also available online at www.copper.org and at www.homeplanningnews.com.

For more information on the topics mentioned in this newsletter go to:

All-Clad MetalCrafters — www.all-clad.com

Dead Sea Scrolls Foundation — www.deadseascrollsfoundation.org

San Diego Natural History Museum — www.sdnhm.org

Monterey Bay Aquarium and Research Institute — www.mbari.org

FlatWire — www.flatwire.com