

Archaeology

Bruce Bower reports from Baltimore at the First Joint Archaeological Congress

Getting the lead out

Modern Americans and Britons have 1,000 times more lead in their bones than did preindustrial peoples who lived a millennium ago, according to an anthropologist at the University of California, Irvine.

Ten years ago, Jonathon E. Ericson and his colleagues obtained bones after autopsies of modern-day residents of the United States and England, and reported lead levels 500 times higher than those measured in the bones and teeth of Peruvians living 1,600 years ago (SN: 5/5/79, p.293). They now find lead levels twice as low as those of the Peruvian remains in the bones and teeth of two other ancient groups: Chumash villagers who lived on the California Coast near Malibu around A.D. 1000 and Anasazi Indians who inhabited a site in Arizona between A.D. 1000 and A.D. 1300.

The investigators use meticulous laboratory techniques to minimize the lead added during collection and transport of bones. They calculate lead contamination by comparing the level of lead to calcium in the bone.

Archaeological data of this type establish "natural" chemical levels in bone and are "extremely important to estimate the effects of environmental toxicity in modern society," says C. Rainer Berger of the University of California, Los Angeles.

Boat resurfaces at Sea of Galilee

In January 1986, a drought in Israel produced an archaeological windfall. The waters of the Sea of Galilee receded, and two brothers from a nearby kibbutz noticed the partial outline of a boat emerging from its muddy banks.

Archaeologists and volunteers, directed by Shelley Wachsmann of the Israel Department of Antiquities and Museums in Tel Aviv, worked feverishly for two weeks to excavate the 27-foot-long vessel and preserve it in a makeshift concrete pool. The boat—the only ancient craft found at the Sea of Galilee—is now in a museum undergoing preservation treatment, Wachsmann says. It dates to between 100 B.C. and A.D. 70.

The boat is of a class described in the Gospels and in the writings of 1st century A.D. Jewish historian Josephus, Wachsmann notes. Its crew of five used four oars to propel the vessel and a wider oar for steering. Total capacity was at least 15 men.

Wachsmann says wear and tear at the craft's joints suggests it spent 10 to 20 years sailing the Sea of Galilee. He adds it may have participated in a bloody battle described by Josephus that took place on the lake in A.D. 67.

More finds from Bronze Age ship

A Bronze Age shipwreck discovered off a rocky cape in southern Turkey more than four years ago (SN: 12/8/84, p.359) continues to yield important artifacts. The trading vessel, probably of the Canaanite culture, sank around 1600 B.C.

Last summer's expedition to the oldest known shipwreck uncovered two new types of copper ingots, once used to shape bronze tools and weapons, says expedition codirector George F. Bass of Texas A&M University in College Station. One of the ingot styles, with two handles, is portrayed in ancient Egyptian wall paintings of metal working, Bass notes. The other ingot is shaped like a dog biscuit and does not resemble any other Bronze Age ingots found in the Mediterranean.

Other finds last summer include: an ivory wand, slightly larger than a pencil, the purpose of which is unknown; two scarabs apparently from northern Syria; a gold pendant the size of a man's hand; and a cache of Syrian pottery.

A form of resin previously found in jars on the ship was probably imported from Syria to Egypt for use as incense in religious rituals, Bass says.

Astronomy

Ivars Peterson reports on a meeting of the American Astronomical Society in Boston

Missing by more than a mile

The center of the Milky Way galaxy has long been known as the source of intense gamma-ray emissions. Now a team from the California Institute of Technology in Pasadena has determined that the bulk of the emissions are coming not directly from the galactic center but from a single source at least 340 light-years away from the center. Until this discovery, most astronomers suspected the galactic nucleus itself as the gamma-ray source.

The researchers, led by Thomas A. Prince, made the discovery using a sensitive, automated gamma-ray camera hanging from a balloon floating 120,000 feet above Alice Springs in Australia. The emissions appear to come from a previously known X-ray object. In the gamma-ray range, this object is only slightly less luminous than Cygnus X-1, the brightest known gamma-ray source in the galaxy. The researchers suspect the object may be a black hole or a neutron star onto which matter is still settling.

Prince and his team plan to continue their gamma-ray observations later this spring. One aim is to see if the galactic center has a gamma-ray source that happened to be off when their initial observations were made.

The researchers will also look for signs of positron annihilation. Matter falling onto a neutron star or black hole produces copious amounts of gamma rays, which in turn generate large numbers of positrons (the antimatter equivalent of electrons). A collision between a positron and an electron destroys the pair, releasing energy in the form of gamma rays of a particular energy. Scientists first detected positron-annihilation emissions from the galactic center in the 1970s, but the signals mysteriously disappeared in 1980. Recently, Crawford J. MacCallum of the Sandia National Laboratories in Albuquerque, N.M., and his collaborators, also using balloon-based observations, found evidence the emissions may be starting again.

Life at the end of the line

When stars like the sun exhaust their nuclear fuel, they end their lives as compact objects known as white dwarfs. Such objects are thought to fade away quietly as they gradually cool over billions of years. But Howard E. Bond of the Space Telescope Science Institute in Baltimore and his colleagues believe they have found evidence that a white dwarf may suddenly balloon back into a red-giant phase, casting off additional mass, then contract again into a white dwarf.

The evidence is a glowing cloud of gas, roughly the size of our solar system, surrounding a star that has clearly been a white dwarf for a long time because it also sits at the center of a much wider, fainter, older gas shell. The star apparently shed the gas quite recently, suggesting that white-dwarf stars may have some mechanism, not yet identified, by which they lose mass or reignite their nuclear engines for a brief period.

A supernova test of special relativity

The explosion of supernova 1987A released a burst of approximately 10^{58} neutrinos and antineutrinos, of which 19 were captured in Earth-based detectors. Those neutrinos, after traveling more than 160,000 light-years from the Large Magellanic Cloud, arrived within a period of 12 seconds. According to Kenneth Brecher of Boston University, these observations provide the most stringent test to date of a central postulate in Einstein's special theory of relativity.

Brecher and student Joao L. Yun use the data to show that the speed of the supernova neutrinos is independent of the speed of their individual sources. Their calculations confirm Einstein's postulate that the speed of light (or of any mass-less particle) doesn't depend on the source's speed to an accuracy of better than 1 part in 100 billion.