

## Archaeology

Bruce Bower reports from Boston at the annual meeting of the Archaeological Institute of America

### Uncovering Rome's 'Virgin' territory

In ancient Rome, the residence of the Vestal Virgins — with its large court surrounded by columns and three massive water basins — was reserved for six young virgins who served the goddess Vesta and exercised great influence in the Roman state. Archaeologists have long held that Vesta's shrine was built over an older structure after Rome burned in A.D. 64. But excavations of the structure by scientists at the American Academy in Rome, described by Russell T. Scott of Bryn Mawr (Pa.) College, reveal several phases of construction dating as far back as the late 7th century B.C.

Structural remains around the Vestal courtyard indicate the site took on cultic and civic functions during the 6th century B.C., Scott says. At that time, a street of stone slabs connected Vesta's shrine to the Palatine, the principal of the seven hills of ancient Rome.

The structure was overhauled in a major construction project of the 2nd and 1st centuries B.C., Scott says.

Although the cult of Vesta had remarkable durability in ancient Rome, "the reasons for the emergence of the Vestal Virgins are unclear," Scott maintains.

### Soldier of misfortune

The remains of Sardis, a city established in the 7th century B.C. as the capital of Lydia in what is now Turkey, include a colossal defensive wall that Persian invaders partially destroyed around 547 B.C. (SN: 11/22/86, p.328). Within the wall's debris, investigators have now uncovered the skeleton of a man in his early 20s, apparently a soldier, lying near a military helmet made of iron and trimmed with bronze.

Bone development in the arms suggests the man regularly carried a heavy shield and weapons, reports Sardis field director Crawford H. Greenewalt Jr. of the University of California, Berkeley. The skeleton's left forearm — broken just before death — is raised in a gesture of self-defense; the right hand still grips a small stone. "This man may have been a stone thrower for the Lydian army," Greenewalt suggests.

The helmet is a prototype of later Roman and medieval helmets, he contends. Hanging from its skullpiece are the remains of two rectangular neck guards made of goat leather.

The sacking of Sardis in the mid-6th century B.C. buried and preserved a legion of ancient Lydian artifacts. "Sardis is an archaeologist's dream," Greenewalt says.

### To live and die in ancient Turkey

A cemetery is an unlikely place for the living to set up homes, but that is what happened near the ancient Turkish city of Gordion, capital of the Phrygian kingdom in the 8th century B.C. At that time, a rural community outside the city walls was built on top of a burial ground dating to approximately 1500 B.C., when the Hittites controlled central Turkey, says Gunlog E. Anderson of Wilson College in Chambersburg, Pa.

The evidence indicates "these people knew they were building houses in the middle of an ancient cemetery," Anderson asserts. The reasons for the macabre location remain unclear, she notes, but inhabitants of the more than two dozen structures ironically may have been employed by Gordion's elite to construct elaborate royal burials, "the major public works of the day."

Each of the simple one- or two-room units under excavation by Anderson and her colleagues was recessed into the slope of a hill. The team has also uncovered hearths, baking areas and storage huts.

Residents of the site raised animals and pursued agriculture, Anderson says. Stone figures of people and birds found in two houses differ from the Phrygian style, suggesting the community included a mix of ethnic backgrounds.

## Astronomy

### A distorted view of the Southern Crab

The Crab nebula is one of the more famous astronomical sights visible from the Northern Hemisphere. But it takes a well-developed imagination to see the shape of a crab in its envelope of glowing gases. That designation better suits the crab-like appearance of a recently discovered nebula, He 2-104, in the Southern Hemisphere constellation Centaurus. He 2-104's crustacean shape is evident in the accompanying photograph of the object as seen in the light emitted by nitrogen ions.



European Southern Observatory

But why does the "Southern Crab" have this unusual shape? New evidence suggests this nebula represents an important but comparatively brief stage in the evolution of certain pairs of interacting stars.

Julie H. Lutz of Washington State University in Pullman and her colleagues argue in the November PUBLICATIONS OF THE ASTRONOMICAL SOCIETY OF THE PACIFIC that the Southern Crab may represent a link between symbiotic stars and planetary nebulas — astronomical entities usually put into separate categories. Astronomers picture symbiotic stars as binary systems in which interactions between a cool red giant and a small, hot star excite gas to produce light of particular wavelengths. Planetary nebulas result from the ejection of gaseous material as a star makes the transition from the red-giant to the white-dwarf stage of stellar evolution.

"Our results, as well as the studies of others, show that He 2-104 is a complicated object," Lutz and her colleagues report. The system appears to consist of a pulsating red giant with a small, hot companion. Dust obscuring the red giant makes it visible only in the infrared.

The hot companion is either dust-enshrouded or too faint to show up in photographs. A disk of material representing mass lost from the red giant surrounds the entire system. That material is visible as a glowing band of gas and dust that constitutes the crab's body. Some of the material ejected by the red giant has also accumulated as a smaller, high-density disk ringing just the hot star. The "crab legs" are the visible traces left by high-velocity winds shooting out of the hot star, as deflected and channeled by the two gas and dust disks, Lutz and her co-workers propose.

"This model for He 2-104 is neither that of a symbiotic star nor that of a planetary nebula," they say. "We believe that it is an object in transition between the two stages of evolution." In this scenario, the red giant would continue to lose mass, causing the outer disk to thicken further. Eventually, the red giant would shed its outer layers to produce a true planetary nebula. At the same time, the two stars in the system would move closer together. The resulting nebula would probably have a distinctive butterfly shape.

"This is what we expect if He 2-104 represents a way for some symbiotic stars to make the transition to the planetary nebula phase," the researchers write. In support of their argument, they cite the discovery of a small number of butterfly-shaped planetary nebulas, which may represent just such an endpoint. To check the model further, astronomers must now search for traces of extended structures surrounding other, known dust-enshrouded symbiotic stars and make more measurements of the velocities of material in various regions surrounding such objects.

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