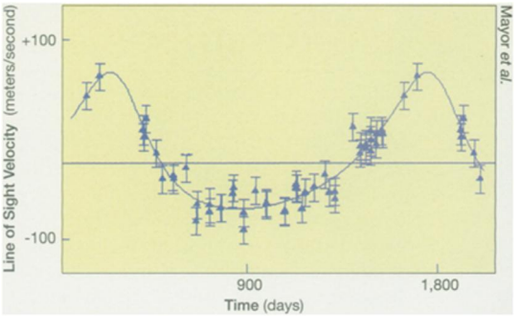
Astronomers find long-period planet

Since 1992, surveys of the motion of several hundred nearby stars have exposed an intriguing secret: 12 of the stars possess planetary companions. Nearly all the planets hug their parent stars, but that's no surprise. The closer the planet, the greater the wobble it induces in a star's motion, and the easier it is to detect. That's why the most recent discovery stands out from the crowd.

Astronomers reported this week that an unseen planet, at least 3.3 times the mass of Jupiter, lies about 2.5 times farther from its parent star than Earth does from the sun. The planet's distance to the parent star, 14 Herculis, and its orbital period of 4.4 years are the largest that have been definitively recorded. Hints that another star has a much more distant planet will take years to confirm (SN: 6/15/96, p. 373).

The larger the separation between a planet and a star, the easier it should be to distinguish its feeble glow from the bright glare of its parent. Thus the newly found planet makes "a very promising candidate for direct imaging," says codiscoverer Michel Mayor of the Geneva Observatory. He announced the findings at a conference on planet and star formation in Santa Barbara, Calif.

Mayor notes that images will almost certainly have to wait until the launch of a specially designed telescope. Ground-based observations pose a problem because the star is 140 million times brighter than the planet in visible light, calculates Michael Shao of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. At an infrared wavelength of 25 micrometers, the star is only about 40,000 times brighter, but infrared detection would require a group of Earth-orbiting telescopes, working in concert as an interferometer, Shao notes. Such a system may be launched in about a decade.



Sign of a planet: A periodic wobble in the motion of the star 14 Herculis.

Mayor and his colleagues, including Didier Queloz of JPL and the Geneva Observatory, have monitored 14 Herculis since 1994, using a spectrograph mounted on a 1.9-meter telescope at the Haute-Provence Observatory in France.

Another team of planet hunters told SCIENCE NEWS that it has found supporting evidence of the planet. Over the past year, Geoffrey W. Marcy of San Francisco State University and the University of California, Berkeley and his colleagues have monitored 14 Herculis using the Keck 1 Telescope on Hawaii's Mauna Kea. "We definitely confirm this planet, [but] we will need one additional year of data to be able to verify the exact orbital period," says Marcy.

Measuring stellar wobbles has also suggested that failed stars, known as brown dwarfs, are sometimes companions to sunlike stars. At the meeting, Mayor presented evidence that companion brown dwarfs are in fact rare.

He and his colleagues had originally deduced that 12 of the stars they had surveyed were accompanied by brown dwarfs. However, their detection technique tracks motion along a single direction, the line of sight to Earth, and can place only a lower limit on the mass of an orbiting body. Data from the Hipparcos satellite, which measures stellar motion across the sky, has allowed more accurate estimates of the mass of 6 of the 12 brown dwarf candidates and revealed that all of them are heavy enough to qualify as low-mass stars. Marcy and his team find no brown dwarf companions among the 107 stars in their long-term survey.

The findings suggest that planets and low-mass stars are much more commonly associated with sunlike stars than brown dwarfs are. Mayor speculates that the collapse of small clumps of gas and dust, which could lead to the formation of a brown dwarf, is thwarted in regions where sunlike stars are being made.

Mayor had planned to announce the discovery of another planet, orbiting HD 166435 (SN: 6/27/98, p. 405). He suspects that what he thought was a wobble may be an aberration due to the star's rotation and magnetic activity. *—R. Cowen*

Ancient fire use flickers inside cave

China's Zhoukoudian cave in Beijing contains a set of deposits that accumulated from 500,000 to 200,000 years ago. As well as yielding the famous Peking Man fossils, this site has also provided the oldest broadly accepted evidence for controlled fire use by members of the human lineage.

However, a new analysis of artifact-bearing sediment at the Chinese cave raises doubts about whether prehistoric folks indeed built fires there.

A number of burned animal bones lie in the same Zhoukoudian soil layers as stone tools, perhaps reflecting intentional fire use, reports a team led by biologist Steve Weiner of the Weizmann Institute of Science in Rehovot, Israel. But despite an intensive investigation, Weiner's group failed to uncover remnants of ash, charcoal, or hearths in this sediment, any of which would solidify the evidence for ancient campfires.

"Although indirect evidence for burning is present [at Zhoukoudian], there is no direct evidence for . . . controlled use of fire by humans," the scientists write in the July 10 SCIENCE.

More than 60 years ago, the first investigators of the cave also reported finding burned bones, as well as antlers and pieces of wood, in sediment that contains stone implements. Soil associated with the cave's artifacts exhibited signs of having been heated or baked, they maintained.

After preparing the site in 1996 and 1997 for renewed investigations, Weiner and his coworkers collected new soil samples and animal bones from two sediment layers that contain stone artifacts. Evidence of burning appeared on a small proportion of the unearthed bones. Some of these burned bones were turquoise colored, an indication that only after fossilization were they exposed to fire, probably naturally ignited, the scientists hold.

Chemical analyses of the Zhoukoudian soil uncovered no signs of wood ash or its byproducts, even though several earlier descriptions of the site had assumed that artifacts lay in ash-saturated sediment.

Several alleged hearths contain no charcoal but display a mix of silt, clay, and organic matter that probably accumulated in a pond of water at a time when the Zhoukoudian cave was more open to the elements, say Weiner and his colleagues.

"This is a valuable new analysis that puts a big question mark over what was thought to be the best evidence for ancient fire use," remarks anthropologist Christopher B. Stringer of the British Museum in London.

More than a decade ago, Stringer directed a preliminary investigation of Zhoukoudian soil samples that also failed to find any signs of ash.

A few locations in Europe bear convincing evidence of ancient fire use that occurred at least 100,000 years ago and perhaps as early as 300,000 years ago, Stringer says.

Several sites dating to around 1 million years ago in southern and eastern Africa contain pieces of burned bone or wood. These materials do not represent "cast-iron evidence" of fire use by human ancestors, asserts anthropologist Bernard Wood of George Washington University in Washington, D.C. *—B. Bower*