

Observations Hint at Primeval Galaxy

Peering ever deeper into space and further back in time, astronomers seek the oldest ancestors of ordinary galaxies like the Milky Way. These early relatives would represent objects still in the process of forming their first generation of stars. For more than a decade, several teams of astronomers have sought, but failed to find, compelling evidence of one of these primeval objects.

Now, two researchers say they may have reached that elusive goal.

Their observations, they assert, reveal that a galaxy discovered in the vicinity of a faraway quasar ranks as one of the most distant galaxies ever found. Moreover, its pattern of light emission strongly suggests that it qualifies as a primeval galaxy undergoing its first wave of star-birth. Richard G. McMahon of the University of Cambridge in England and Esther M. Hu of the University of Hawaii in Honolulu shared their early findings with SCIENCE NEWS this week.

"We're excited by this finding because it may represent the way an ordinary galaxy looks [early in the cosmos]," says McMahon. That interpretation isn't completely obvious, he admits, given the galaxy's relative proximity to a distant powerhouse, a quasar dubbed BR2237-0607.

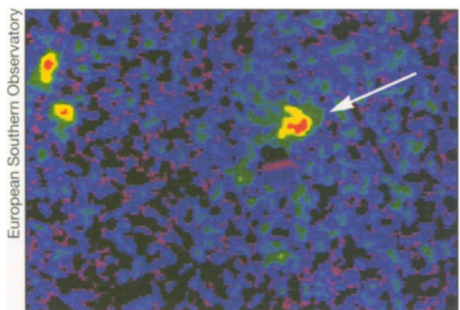
Astronomers often view quasars as the high-energy oddballs of the universe. McMahon explains that galaxies close to these dazzling light beacons don't represent a typical galaxy in the cosmos. Moreover, when quasar light blasts nearby objects, it may make them appear considerably brighter than they actually are.

Observations with the 2.2-meter University of Hawaii telescope atop Mauna Kea, however, show that the galaxy resides several hundred light-years from the quasar—far enough away that the brilliant powerhouse doesn't disturb the faint body, McMahon says. "Our interpretation is that this is a very young, ordinary galaxy," he says.

McMahon adds that spectra taken in July with the W.M. Keck Telescope on Mauna Kea reveal that cosmic expansion has dramatically shifted the wavelength of radiation from the galaxy. The measured redshift of 4.5, roughly the same as that of the neighboring quasar, means that the light now reaching Earth left the galaxy when the universe was less than 10 percent of its current age—under 1 billion years old. Ultraviolet emission from hydrogen gas, typical of young stars, and the absence of significant amounts of other radiation hint that stars formed in the galaxy very recently, Hu adds.

Like other astronomers, cosmologist Edmund Bertschinger of the Massachu-

setts Institute of Technology hasn't seen the new results, but he notes that finding a galaxy so early in the history of the universe "is a bit like finding the oldest



False-color image (arrow) of galaxy near the quasar BR1202-0725.

hominid. . . . As we go further back in time and find the oldest galaxies similar to our own, we have the chance of learning much about how structure formed in our universe."

McMahon began collaborating with Hu after he and his British colleagues discovered some 40 quasars, including BR2237-0607, that rank among the most distant objects known in the cosmos (SN: 9/17/94, p.188). Quasars are thought to reside at the center of galaxies, and galaxies tend to occur in clusters. So McMahon decided to search around the

distant quasars in the hope of finding far-away, possibly primeval galaxies.

Probing the environs of another distant quasar, BR1202-0725, McMahon and Hu told SCIENCE NEWS that they may have pinned down the location of a galaxy imaged by other astronomers in the infrared with the Keck Telescope and in visible light using the European Southern Observatory's (ESO) New Technology Telescope in La Silla, Chile. In a press release last week, ESO astronomers use the color and brightness of the faint galaxy to argue that it is primeval and may account for a huge cloud of hydrogen gas that resides at a distance corresponding to a redshift of 4.38.

But McMahon and Hu have evidence that the galaxy lies even farther away at about the same distance from Earth as the quasar. They find that light from the galaxy peaks around a wavelength corresponding to characteristic emissions from hydrogen at the quasar's location. With a redshift of 4.7, the quasar is significantly farther away than the hydrogen cloud. If detailed spectra confirm this estimate of the galaxy's location, the galaxy would be the most distant known. But it probably isn't a primeval ancestor of ordinary galaxies, says McMahon, because it lies too close to the quasar.

— R. Cowen

Can't take the heat? Don't enter the nest

Japanese honeybees have devised a defensive strategy worthy of the best pro football coaches. In fact, this ploy accounts for *Apis cerana japonica's* impressive record of protecting its nest against attacks by the giant hornet, *Vespa mandarinia japonica*.

One might think that the honeybees sting their foes to death.

Nope. They tackle the hornets' offensive linemen, then use body heat to wipe them out, assert Masato Ono and his coworkers at Tamagawa University in Tokyo.

Upon finding a honeybee nest, a hornet kills a few of the bees and takes them home to its young. The forager usually manages to repeat this hunting trip successfully a few times. Then it makes a fatal mistake: It rubs a pheromone on the hive, signaling other hornets to attack the nest, the team reports in the Sept. 28 NATURE.

However, the honeybees also detect

Japanese honeybees form a ball around an invading hornet (above), killing it with their body heat (below).

