

Researchers find ancient city of 'modern' galaxies

May 11 2010



A surprisingly large collection of galaxies (red dots in center) stands out at a remarkably large distance in this composite image combining infrared and visible-light observations. NASA's Spitzer Space Telescope contributed to the infrared component of the observations, while shorter-wavelength infrared and visible data are provided by Japan's Subaru telescope atop Mauna Kea, Hawaii. Image credit: NASA/JPL-Caltech/Subaru

Using NASA's Spitzer Space Telescope, a Texas A&M University-led team of astronomers has uncovered what may be the earliest, most distant cluster of galaxies ever detected.

The group of roughly 60 galaxies, called CLG J02182-05102, is nearly 10 billion years old — born just 4 billion years after the Big Bang. However, it's not the size nor the age of the cluster that amazes the team of researchers led by Dr. Casey Papovich, an assistant professor in the Texas A&M Department of Physics and Astronomy and member of the

George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy. Rather, it's the surprisingly modern appearance of CLG J02182-05102 that has them baffled — a huge, red collection of galaxies typical of only present-day galaxies.

"It's like we dug an archaeological site in Rome and found pieces of modern Rome amongst the ruins," explains Papovich, lead author of the team's study to be published in *Astrophysical Journal*.

While its neighboring galaxies appear vastly smaller and far fainter, Papovich says CLG J02182-05102 stands out as a densely-populated bundle of ancient galaxies. Enormous red galaxies at the center contain almost 10 times as many stars as our Milky Way, he notes, combining for a total size that rivals that of the most monstrous galaxies of our nearby universe.

Before now, Papovich says, such a finding would be considered by many astronomers to be highly unlikely, considering the time frame in which they were found.

"The predictions are that these things should be very rare when the universe was 4 billion years old, and yet, we found them," Papovich explains. "Not only did we find them, it looks for all intents and purposes like they had already formed completely and evolved into the large concentrations of galaxies that we see in clusters today."

Exactly why these particular galaxies are fully formed that early is what Papovich and his collaborators — which include astronomers from NASA's Jet Propulsion Laboratory at the California Institute of Technology (Caltech) as well as Carnegie Observatories — hope to one day uncover, but for now, studying CLG J02182-05102 could help them and other researchers better understand how galaxies form and cluster in general.

The find resulted from a project initiated two years ago when Papovich and his team observed an area of the sky that could encompass 250 full moons, the largest extragalactic survey of space ever made — the Spitzer Wide-area InfraRed Extragalactic (SWIRE) survey. The team focused on a cosmic region of the survey that previously had been observed by other instruments including Japan's Subaru telescope in Mauna Kea, Hawaii, and the European Space Agency's orbiting XMM-Newton telescope. This, combined with infrared data from the United Kingdom Infrared Telescope — also in Hawaii — and Spitzer's Public Ultra Deep Sky survey instantly revealed a number of distant galaxies.

It wasn't until Papovich's group studied faint light from CLG J02182-05102's least-dim galaxies that they were able to determine they had found a cluster that contained about 60 galaxies full of old, red stars, at a time when the universe was only 4 billion years old — about 30 percent of the universe's current age of 13.7 billion years. At this point in time, most other galaxies would still be forming their very first stars and certainly would not have congregated with other galaxies yet.

In essence, Papovich said the [galaxies](#) in CLG J02182-05102 must have subscribed to a "rock 'n' roll" lifestyle — they lived fast and died young. It's another mystery Papovich hopes to solve through deeper observations, including spectroscopy, with the Hubble Telescope later this year.

"That's one of the reasons this is so interesting," he adds. "It seems that they somehow had a premonition they would end up in these big clusters, so that's another thing we want to find out."

More information: For more information on NASA's Spitzer Space Telescope, visit www.spitzer.caltech.edu/

Provided by Texas A&M University

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