

# Astronomers puzzled by galaxies that formed “too early”

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Courtesy of Tufts University  
and World Science staff

Some of the biggest galaxies may have formed billions of years earlier than prevailing scientific models predict, suggesting something is wrong with the models, astronomers are reporting.

“We have found a relatively large number of very massive, highly luminous galaxies that existed almost 12 billion years ago when the universe was still very young, about 1.5 billion years old. These results appear to disagree with the latest predictions from models of galaxy formation and evolution,” said astrophysicist Danilo Marchesini of Tufts University in Massachusetts, lead author of a report on the findings published online Nov. 24 in the *Astrophysical Journal*.

The galaxies, estimated to be five to ten times more massive than our own, were among a sample of galaxies studied by his Marchesini’s group and said to be 1.5 billion to 2 billion years old. The ages were gauged based on the galaxies’ distance and the time their light would take to reach us.

These estimates might be somewhat off, but it’s not clear whether any such error could be large enough to explain the findings, the researchers said. Either way, they added, the discovery of such massive, old galaxies would itself be notable, since such a galaxy population has never been seen.

The scientists said they got a fuller view of galaxies at this early stage than was previously available by combining existing data with deep images obtained through a new system of customized light filters. The galaxies glow in infrared light, which is invisible to the unaided eye, in an effect thought to be caused by their vast distance combined with an ongoing expansion of the universe.

More than four in five of these massive galaxies were also very bright in infrared light, showing that they were either undergoing violent activity, rapidly growing or both, the investigators added. The violent activity would probably be due to black holes at the centers of the galaxies eating vast amounts of material, which is drawn to their intense gravity.

“It is clear that our understanding of how massive galaxies form is still far from satisfactory,” said Marchesini. He didn’t venture an explanation for the findings, but added that “the existence of these galaxies so early in the history of the universe, as well as their properties, can provide very important clues on how galaxies formed and evolved shortly after the Big Bang,” the moment when physicists believe the universe was born.