

New study examines which galaxies are best for intelligent life

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Giant elliptical galaxies are not as likely as previously thought to be cradles of technological civilizations such as our own, according to a recent paper by a University of Arkansas astrophysicist.

[The paper](#), published May 1 in the journal *Monthly Notices of the Royal Astronomical Society*, contradicts a 2015 study that theorized giant elliptical galaxies would be 10,000 times more likely than spiral disk galaxies such as the Milky Way to harbor planets that could nurture advanced, technological civilizations.

The increased likelihood, the authors of the 2015 study argued, would be because giant elliptical galaxies hold many more stars and have low rates of potentially lethal supernovae.

But Daniel Whitmire, a retired professor of astrophysics who is an instructor in the U of A Department of Mathematical Sciences, believes that the 2015 study contradicts a statistical rule called the principle of mediocrity, also known as the Copernican Principle, which states that in the absence of evidence to the contrary, an object or some property of an object should be considered typical of its class rather than atypical.

Historically, the principle has been employed several times to predict new physical phenomena, such as when Sir Isaac Newton calculated the approximate distance to the star Sirius by assuming that the sun is a typical star and then comparing the relative brightness of the two.

"The 2015 paper had a serious problem with the principle of mediocrity," said Whitmire. "In other words, why don't we find ourselves living in a large elliptical galaxy? To me this raised a red flag. Any time you find yourself as an outlier, i.e. atypical, then that is a problem for the principle of mediocrity."

He also had to show that most stars and therefore planets reside in large elliptical galaxies in order to nail down his argument that the earlier paper violated the principle of mediocrity.

According to the principle of mediocrity, Earth and its resident

technological society should be typical, not atypical, of planets with technological civilizations elsewhere in the universe. That means that its location in a spiral-shaped disk galaxy should also be typical. But the 2015 paper suggests the opposite, that most habitable planets would not be located in galaxies similar to ours, but rather in large, spherical-shaped elliptical galaxies.

In his paper, Whitmire suggests a reason why large elliptical galaxies may not be cradles of life: They were awash in lethal radiation when they were younger and smaller, and they went through a series of quasar and star-burst supernovae events at that time.

"The evolution of elliptical galaxies is totally different than the Milky Way," said Whitmire. "These galaxies went through an early phase in which there is so much radiation that it would just completely have nuked any habitable planets in the galaxy and subsequently the star formation rate, and thus any new planets, went to essentially zero. There are no new stars forming and all the old stars have been irradiated and sterilized."

If habitable planets hosting [intelligent life](#) are unlikely in large elliptical galaxies, where most stars and planets reside, then by default [galaxies](#) such as the Milky Way will be the primary sites of these civilizations, as expected by the principle of mediocrity, Whitmire said.

More information: Daniel P Whitmire. The habitability of large elliptical galaxies, *Monthly Notices of the Royal Astronomical Society* (2020). [DOI: 10.1093/mnras/staa957](https://doi.org/10.1093/mnras/staa957)

Provided by University of Arkansas

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