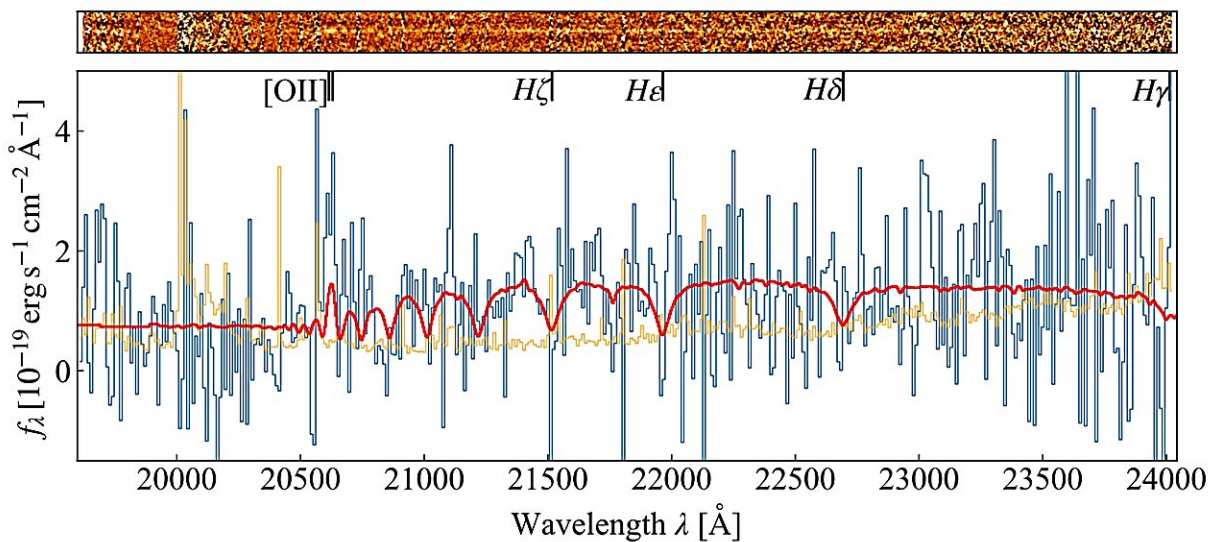


Astronomers discover new massive quiescent galaxy

September 6 2023, by Tomasz Nowakowski



Keck/MOSFIRE K-band spectrum of COSMOS-1047519 smoothed over 5 pixels. Credit: Kakimoto et al., 2023.

Astronomers report the discovery of a new massive and quiescent galaxy at a high redshift. The galaxy, which received designation COSMOS-1047519, was detected using the Keck I telescope. The finding was detailed in a paper published August 29 on the pre-print server *arXiv*.

Massive galaxies that stopped forming stars (known as massive quiescent galaxies) are plausible progenitors of giant elliptical galaxies. Given that these objects formed stars earlier and assembled their [stellar masses](#) more quickly, they could be key to improving our understanding of the process of galaxy evolution.

To date, only very few spectroscopically confirmed [high-redshift](#) (above 4.0) quiescent galaxies have been detected. Finding new galaxies of this type is of high importance for astronomers as these objects could advance our understanding of the early stages of the universe.

Now, a team of astronomers led by Takumi Kakimoto of the Graduate University for Advanced Studies in Japan, has confirmed the detection of another high-mass quiescent galaxy—at a redshift of 4.53. The finding was made using the Keck/MOSFIRE spectrograph.

"We present the spectroscopic confirmation of a massive quiescent galaxy at $z = 4.53$ based on the Keck/MOSFIRE observation. We confirm a very large stellar mass and a very low star formation rate from the extensive SED [spectral energy distribution] fitting using both the photometry and spectrum," the researchers wrote in the paper.

The observations found that COSMOS-1047519 has a mass of about 60 billion solar masses and a star-formation rate (SFR) at a level of only 10 [solar masses](#) per year. The galaxy's stellar age is estimated to be 180 million years.

The [astronomers](#) underlined that the estimated SFR is more than 1 dex below the [star-forming](#) main sequence at a redshift of 4.5. The star formation history of COSMOS-1047519 inferred from the SED fitting suggests that the galaxy experienced a starburst at a redshift of 5.0, followed by rapid quenching with a timescale of about 100 million years.

Therefore, the results make COSMOS-1047519 one of the youngest quiescent galaxies at a redshift higher than 3.0. The findings also indicate that COSMOS-1047519 is likely a galaxy in the process of being quenched.

Trying to find the [physical processes](#) responsible for the suppression of star formation in COSMOS-1047519, the authors of the paper propose the most plausible hypothesis.

"These findings suggest that gas depletion due to the starburst and/or AGN feedback triggered by galaxy-galaxy interactions or mergers may be responsible for quenching," the researchers concluded.

More information: Takumi Kakimoto et al, A massive quiescent galaxy in a group environment at $z=4.53$, *arXiv* (2023). [DOI: 10.48550/arxiv.2308.15011](https://doi.org/10.48550/arxiv.2308.15011)

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