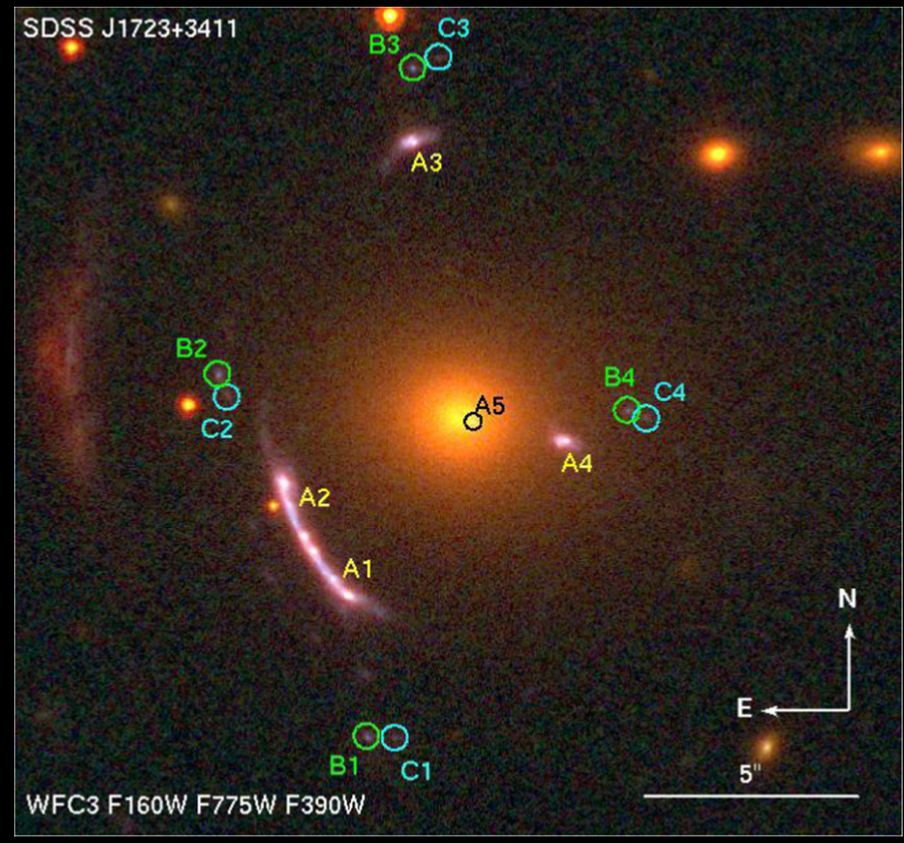
Studying the History of Star Formation with Webb

Astronomers can trace the history of star formation in the universe by examining distant galaxies and the ultraviolet and visible light emitted by gas when it is heated by young, massive stars within each galaxy. The distant galaxy SDSS J1723+3411 lies 8.9 billion light-years away. The galaxy is seen as a curved arc of light, as a closer cluster of galaxies creates a “gravitational lens” that magnifies and distorts the light from more distant galaxies behind it. This fortunate quirk of geometry and gravity allows detailed investigation of the galaxy using multiple observatories. These measurements represent the most comprehensive list of emission lines (light emitted by heated gas) published for the distant universe.

There observations are also being used to plan upcoming observations for some of the highest-priority science of the James Webb Space Telescope. Webb is ideal for investigating galaxy and star formation in the very early universe. Light from objects in the distant universe is stretched out by all the expanding space it had to travel through to get to us, so it loses energy on the way. The extreme distances of these objects means the visible light from the young star will be stretched out into infrared wavelengths, will be nearly out of the range of Webb’s Near Infrared Spectrograph Instrument (NIRSpec). The UV light, however, will be accessible. With NIRSpec’s wide field of view, UV measurements will allow scientists to study large samples of distant galaxies using less telescope time than is currently required.



A Hubble image of SDSS J1723+3411. The bright, multiply-imaged arc "A," encompassing both images A1 and A2, is the subject of this study. The orange-colored blobs are the nearer galaxies creating the gravitational lens.

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