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SPIRAL GALAXY BARS MAY PREVENT NEW STARS

Relevant for: Geography | Topic: The Earth and the Solar System

Long haul: “We believe it will take a few million years for the bar to evacuate the gas that forms stars,” says Koshy George. | Photo Credit: Koshy George

Stars are fundamental building blocks of galaxies and the seeds of these stars are clouds of cosmic dust and gas. Stars are scattered all around the galaxies, and the galaxies themselves are of different types: star-forming spiral galaxies and non-star-forming lenticular and elliptical galaxies. In some spiral galaxies, the stars move in elongated orbits near the centre so that, from far, this portion appears like an illuminated bar. Nearly two-thirds of the disc galaxies in the local universe are found to have this bar structure. “Stellar bars in galaxies are clearly visible in early images taken by photographic plates, and are known to exist in galaxies from early observations of galaxies,” says Koshy George from Ludwig-Maximilians University in Munich, Germany, who has recently co-authored a paper on barred galaxies.

The Milky Way is a barred spiral galaxy. Since not all spiral galaxies have bars, the role of bars – why they exist, what triggers their formation and whether they foster star formation are interesting questions. Some barred galaxies have shown a higher concentration of newly formed stars, suggesting that the bar nurtures star formation. The present work studies four such barred galaxies out of which three, in fact, appear to prevent stars from forming at their central region covered by the length of the bar. “These are all interesting topics of research, and many people around the world are working on that topic,” says Dr. George in an email to *The Hindu.*

What causes a galaxy to be star-forming or not is a puzzle, with the prevailing idea being that star-forming galaxies are converted into non-star-forming galaxies through some mechanism. “[In this paper] we try to understand the role of the stellar bar in quenching star formation in the central region of spiral galaxies,” says Dr. George, about the paper describing the work which is accepted for publication in *Astronomy and Astrophysics*. The work is done in collaboration with scientists from Indian Institute of Astrophysics and Christ University, Bengaluru.

Using data from multiple telescopes, including the Very Large Array, New Mexico, in the US, the IRAM 30 metre telescope, Sierra Nevada, Spain, Sloan Digital Sky Survey etc, the authors study the gas content and star formation along the bar region of four barred spiral galaxies.

In three of the four observed galaxies, they find that the region covered by the length of the bar does not have enough gas (Hydrogen in the atomic form and molecular hydrogen, which is believed to condense and form stars). “We understood this observation as evidence for the bar redistributing the gas in the central region of these spiral galaxies,” says Dr. George. “This is almost like the central regions of whirlpool we see in rivers. There is a cavity formed in the central region with no gas and stars,” he explains.

The researchers do not see the same depletion of gas and stars in the fourth galaxy. The reason, they believe is that this galaxy does not have an old enough bar. “We believe it will take a few million years for the bar to evacuate the gas that forms stars,” says Dr. George. The bar is a complex and dynamic structure and the paper adds an interesting angle by suggesting this method in which it prevents star formation.

“This is probably the tip of the iceberg. We are presenting this as a case for the first time in an evolutionary sequence of four barred galaxies. More statistical samples are needed (which is currently lacking) with new observations from radio to ultraviolet wavelength for more galaxies,”

he says.

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