Spiral galaxies may be dying because of bars

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The red spiral on the left has a bar, while the blue spiral on the right does not.
Image courtesy of the Sloan Digital Sky Survey

With the help of the army of volunteers working on the Galaxy Zoo 2 'citizen science' project an international team of scientists led by a Portsmouth astrophysicist may have discovered what is killing spiral galaxies.

Dr. Karen Masters, of the University of Portsmouth's Institute of Cosmology and Gravitation, led the team whose research shows that the bars found in many spiral galaxies, including our own Milky Way, could be helping to kill them off.

The researchers present their results in the journal *Monthly Notices of the Royal Astronomical Society*.

The overwhelming majority of stars in the universe are found in galaxies like the Milky Way. These vast stellar assemblies contain anything between a few hundred million and one million billion stars and come in a variety of shapes, from irregular to elliptical (shaped like rugby balls) to spirals, where spiral arms wind out in a disk from a central bulge.

About half of these spiral galaxies have a bar – a linear structure of stars crossing the centre. Bars are important for the evolution of galaxies as they provide a way to move material in and out in the disk and possibly help to spark star formation in the central regions. They may even help feed the central massive black hole that seems to be present in almost all galaxies. But bars provide scientists with a great puzzle because it is still not understood why some galaxies have bars and others do not.

The scientists drew on the work of the volunteers taking part in Galaxy Zoo 2, the follow-on from the highly successful Galaxy Zoo project. In this second phase users were asked to make detailed classifications of the galaxies they looked at, including information on the presence of a bar.

With these data – the largest ever sample of galaxies with visual bar identifications – they have shown that red spirals are about twice as likely to host bars as blue spirals. These colors are significant. Blue galaxies get their hue from the hot young stars they contain, implying that they are forming stars in large numbers. In red galaxies, this star formation has stopped, leaving behind the cooler, long-lived stars that give them their red color.

The astronomers conclude that bars might help to kill spiral galaxies, although how they do it remains a mystery.

Dr. Masters sings the praises of the Galaxy Zoo 2 volunteers: “I'm really delighted to publish this first science result from Galaxy Zoo 2. Having

so many people involved in this research is wonderful, and I feel a great weight of responsibility to make sure good science comes out of all the hard work they put into classifying galaxies.

“For some time data have hinted that spirals with more old stars are more likely to have bars, but with such a large number of bar classifications we’re much more confident about our results. And all of this is thanks to the dedication of the volunteers who provide the raw ‘clicks’.

“It’s not yet clear whether the bars are some side effect of an external process that turns spiral galaxies red, or if they alone can cause this transformation. We should get closer to answering that question with more work on the Galaxy Zoo dataset.”

The volunteers – Zooites – share her enthusiasm. Eric Hobein said: "It’s nice to figure out how we help and be a super-tiny part of it all"; while Mike Tracey said: "I had fun doing my bit and my high school students were involved too. It is great to be part of a real life project which can produce real science."

More information: The paper “Galaxy Zoo: Bars in Disk Galaxies”, Masters K. L. et al, will appear in the journal Monthly Notices of the Royal Astronomical Society. A preprint can be seen at arxiv.org/abs/1003.0449

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