Galaxy encounter fires up quasar

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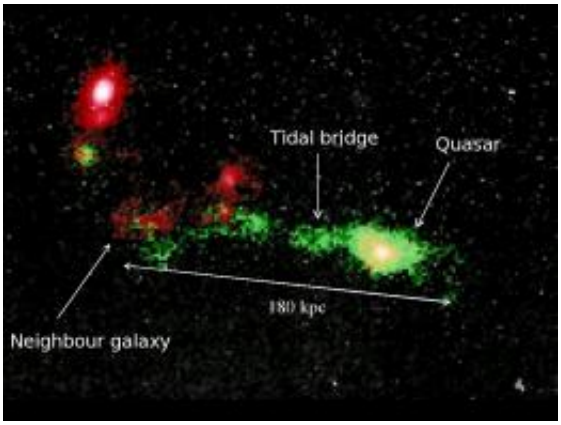

An image of the field around the type 2 quasar SDSS J0123+01 obtained with the OSIRIS tuneable filter on GTC. The red colour shows regions where light is emitted mainly by stars. The green colour shows emission from hot ionized gas. Yellow indicates a mixture of both. The image reveals the existence of a giant nebula of ionized gas which extends for 180 kiloparsecs (590000 light years) or 6 times the size of our galaxy, the Milky Way. The nebula encompasses a bridge of material that connects the quasar physically with the neighbouring galaxy it is interacting with. Credit: Montserrat Villar Martin (IAA-CSIC)

(PhysOrg.com) -- Using two of the world's largest telescopes, an international team of astronomers have found evidence of a collision between galaxies driving intense activity in a highly luminous quasar. The scientists, led by Montserrat Villar Martin of the Instituto de Astrofisica de Andalucía-CSIC in Spain, used the Very Large Telescope (VLT) in Chile and the Gran Telescopio Canarias (GTC) on La Palma in the Canary Islands, to study activity from the quasar SDSS J0123+00.

They publish their work in a paper in the journal *Monthly Notices of the Royal Astronomical Society*.

Several types of galaxies, known as active galaxies, emit enormous amounts of energy from their central region or nucleus, with the most luminous objects known as quasars. Most scientists argue that quasars contain a central black hole, with a mass of at least several million Suns.

The intense gravitational field created by the black hole drags material inexorably inwards. Before falling in, this material settles in an accretion disk where it becomes very hot and emits large amounts of energy responsible for most of the brightness of the quasar. Around the central quasar 'engine' is a torus (thick ring) opaque to the visible light emitted by the accretion disk. From a terrestrial perspective, if the torus is face-on then the radiation from the disk can be seen and the system is designated type 1, whereas in type 2 quasars the torus is edge-on and the radiation is concealed.

"Type 2 quasars are a family of still rather unknown galaxies", explains Montserrat Villar-Martin, who led the research team, "which so far have been investigated mostly from a statistical point of view.

"The goal of our work is to study their individual characteristics in detail. In our study we have obtained some surprising results. For example, we have observed a giant nebula of ionized gas associated with SDSS J0123+00, and signs of an interaction with a nearby galaxy.

"This strengthens the idea that activity in galaxies is partly driven by the exchange of material between the active galaxies (or quasars) and their neighbours".

Although type 2 quasars are more difficult to detect, they are unique laboratories that let astronomers study the quasar environment in great

detail, thanks to the dimming of the central radiation by the surrounding torus.

In the case of SDSS J0123+00, one of the most important results is the discovery of an extended, faint nebula of ionized gas around the entire galaxy. The nebula is about six times larger than our own Milky Way Galaxy and, according to the authors, is probably made of the debris of the interaction between SDSS J0123+00 and its neighbour.

Part of the giant nebula is a bridge of material that connects the two galaxies. This strengthens the hypothesis that the quasar activity is triggered by the interaction between them, producing the accumulation of gas in the galactic central regions and providing material to feed the black hole. This process can also trigger the rapid formation of new stars.

The new results are the first based on images obtained with the tuneable filter of the Optical System for Imaging and low Resolution Integrated Spectroscopy (OSIRIS), the instrument installed on the GTC. The OSIRIS tuneable filter allows astronomers to observe objects in narrow windows across the spectrum of visible light from red to blue, something that with older systems would need more than five thousand narrow band filters.

More information: The research will appear in a paper in Monthly Notices of the Royal Astronomical Society. A preprint can be seen at es.arxiv.org/abs/1006.1517

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https://phys.org/news/2010-06-galaxy-encounter-quasar.html