BULLSEYE GALAXY – SCIENCE & TECHNOLOGY

NEWS: Astronomers have discovered a unique galaxy, named the **Bullseye Galaxy (LEDA 1313424)**, that contains **nine concentric rings** — more than any previously known ring galaxy.

WHAT'S IN THE NEWS?

This rare celestial structure was observed using the **Hubble Space Telescope** and the **W.M. Keck Observatory in Hawaii**. Researchers believe this galaxy may also offer valuable insights into the formation of **giant low surface brightness (GLSB) galaxies**, which are crucial to understanding **dark matter** in the universe.

Introduction to the Bullseye Galaxy (LEDA 1313424)

- **Identification**: Known scientifically as LEDA 1313424, the galaxy is nicknamed the *Bullseye Galaxy* due to its prominent ring-like appearance.
- **Size**: It spans approximately **250,000 light-years in diameter**, making it **about five times larger** than the Milky Way galaxy.
- **Rarity**: The galaxy is considered an *uncommon and transitional structure*, captured during a fleeting stage of galactic evolution.

Unique Multi-Ring Structure

- **Number of Rings**: The Bullseye Galaxy contains **nine distinct concentric rings**, far exceeding the usual two or three rings observed in most known ring galaxies.
- **Significance**: The presence of so many rings is extremely rare and provides astronomers with valuable insights into galactic dynamics following collisions.

Origin of the Rings: Head-On Galactic Collision

- **Collision Event**: Approximately **50 million years ago**, a **blue dwarf galaxy** collided head-on with the Bullseye Galaxy, passing directly through its center.
- **Impact Mechanism**: The gravitational disturbance from the collision triggered **radial ripples in the gas** content of the Bullseye Galaxy.
- **Star Formation**: These ripples compressed the gas, igniting **bursts of star formation** along the circular fronts, resulting in the formation of concentric rings.
- **Current Evidence**: A **gas trail still connects** the Bullseye Galaxy and the blue dwarf, which are now separated by **130,000 light-years**, supporting the collision theory.

Mechanism of Ring Formation

- **Stellar Orbits**: The **original orbits of existing stars remained unaffected** by the collision, as stars are not as easily influenced as gas.
- **Gas Dynamics**: The **gas and newly formed star clusters** reorganized into **wave-like patterns**, which settled into ring formations.
- **Wave Propagation**: These rings act like ripples on a pond, moving outward from the point of collision in regular intervals.

Related Concepts: Low Surface Brightness (LSB) Galaxies

- **Definition**: LSB galaxies have **extremely faint disks**, making them difficult to detect with traditional optical surveys.
- **Star Formation**: Despite possessing large reserves of **hydrogen gas**, they show **minimal visible star formation**.
- **Dark Matter**: They are **dominated by dark matter**, making them key targets for studying **dark matter distribution** in the cosmos.
- **Visibility Challenge**: Their faintness often causes them to be overlooked in large-scale galaxy surveys.

Giant Low Surface Brightness (GLSB) Galaxies

- **Subclass Characteristics**: GLSB galaxies are an especially **massive type of LSB**, with **diffuse and extended stellar disks**.
- **Notable Example**: *Malin 1* — the largest known spiral galaxy — is a GLSB that is **about 6.5 times wider** than the Milky Way.
- **Environmental Isolation**: These galaxies typically exist in **isolation**, located far from denser galaxy clusters.
- **Black Hole Size**: Despite their massive size, GLSBs often have **relatively small central black holes**, implying they are **less evolved** compared to other giant galaxies.