GAIA MISSION: SCIENCE & TECHNOLOGY

NEWS: Europe’s space agency retires Gaia, the cartographer of the cosmos: Its mission & significance

WHAT’S IN THE NEWS?

ESA's Gaia space observatory, which mapped the Milky Way over a decade, officially ended its mission on March 27, 2025. Despite its conclusion, Gaia's vast data will continue to shape astronomical research, with more releases planned in the coming years.

Gaia Mission: A Revolutionary Space Observatory

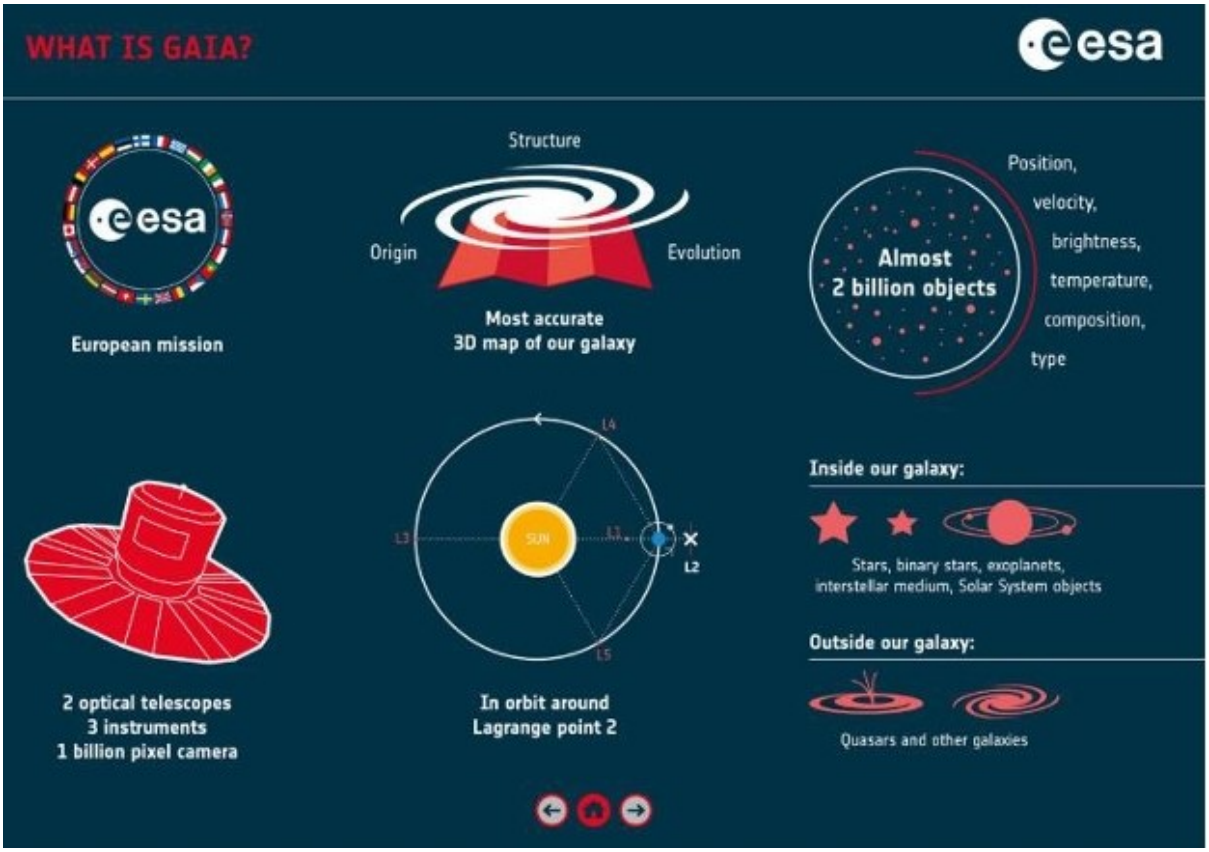
- Launched in December 2013 by the European Space Agency (ESA), the Gaia mission aimed to create the most accurate 3D map of the Milky Way galaxy.
- Over the course of a decade, Gaia took an unprecedented 3 trillion observations of 2 billion stars and celestial objects, drastically advancing the field of astronomical research.
- The mission officially concluded on March 27, 2025, with the spacecraft being passivated, ensuring that it remains inactive for the future.

Scientific Contributions and Discoveries

- **Milky Way's Structure and Evolution:** Gaia provided transformative insights into the structure, evolution, and future trajectory of the Milky Way, reshaping our understanding of the galaxy.
- **Galaxy's Warped Disc:** One of the key findings revealed that the galaxy’s disc is not flat but is warped and wobbles, likely due to gravitational interactions with smaller galaxies in the past.
- **Black Hole Discovery:** Gaia’s observations led to the discovery of a new class of black holes that were previously undetectable through traditional observation methods.
- **Asteroid Mapping:** The mission also mapped over 150,000 asteroids, including some that pose potential hazards to Earth, aiding in planetary defense strategies.

Post-Mission Plans and Data Utilization

- **Data Analysis Continues:** While Gaia's active mission has ended, the data collection and analysis will continue for years. A large portion of its findings are still being processed, with future data releases expected.
- **Upcoming Data Releases:** ESA plans to release the next set of data in 2026, covering the first five-and-a-half years of Gaia’s observations. The final dataset is expected to be available by the end of the decade, offering more detailed insights.



Gaia's Legacy and Future of Astrometry

- **Mapping Limitations:** Despite Gaia's groundbreaking work, the mission has mapped only 2% of the Milky Way's estimated 100 billion stars, leaving vast portions of the galaxy still unexplored.
- **Future Space Telescopes:** Gaia's success provides a foundation for the next generation of space telescopes, enhancing our ability to study cosmic phenomena, such as black holes, planetary evolution, and galactic dynamics.
- **Importance of Astrometry Investment:** The Gaia mission underscores the importance of continued investment in astrometry and deep-space exploration, vital for understanding the universe's origins and its future.

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