

Lumina Simulation

Prelims: *Current events of national and international importance | Space*

Why in News?

Researchers at the Center for Astrophysics | Harvard & Smithsonian have developed Lumina, that reconstructs the first 2 billion years following the Big Bang.

- Lumina is a large-scale cosmological simulation.
- **Objective** - To advance understanding of the formation and evolution of early stars, galaxies, and black holes.
- **Significance** - It helps interpret observations from the James Webb Space Telescope (JWST) and the Nancy Grace Roman Space Telescope.
- **Key Features**
 - **Type** - Cosmological radiation hydrodynamics simulation.
 - **Scale** - Simulates a cubic region approximately 1.5 billion light-years per side, representing a volume over 100 times greater than previous comparable projects.
 - **Computing power** - Utilised over 15,000 graphics processing units (GPUs) on the Frontier supercomputer.
 - **Supercomputer location** - Oak Ridge National Laboratory, Tennessee, USA.
 - **Key advance** - Simulates the interactions among ordinary matter, dark matter, and radiation, while tracking the evolution of the early universe.
- **Significance**
 - **Cosmic Evolution** - Studies the formation of early stars, galaxies and black holes.
 - **Theory Validation** - Examines intergalactic gas and radiation to test cosmological theories against observations.

James Webb Space Telescope (JWST)

- Launched in December 2021.
- Infrared space telescope.
- Studies early galaxies, star formation, exoplanets and the evolution of the universe.

Nancy Grace Roman Space Telescope

- NASA space observatory designed for wide-field infrared surveys.
- Will investigate dark energy, dark matter, exoplanets and large-scale cosmic structures.
- Lumina can help compare theoretical predictions with its observations.

Reference

[Science Daily | Recreated the First 2 Billion Years of the Universe](#)

